ESTUDIOS e INFORMES de la CEPAL

# MARKET STRUCTURE, FIRM SIZE AND BRAZILIAN EXPORTS

Prepared in collaboration with the Institute for Economic and Social Planning (IPEA) of Brazil.

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## PREFACE

This study was carried out within the framework of an Agreement in effect between Brazil's Institute for Economic and Social Planning (IPEA) and the Economic Commission for Latin America and the Caribbean (ECLAC). It is the product of a second collaboration of the two institutions in an empirical study of the relationship between market structure and export performance. The first study, which was published in 1971, appeared only in Portuguese. For this reason it received limited circulation outside Brazil. We are publishing the present report simultaneously in English and Portuguese in order to assure its wide diffusion. The purpose of the research was to provide policymakers with an analysis of the effects of industrial and commercial policies on export performance. Nonetheless, the findings will be of interest to students of Brazil's economy and to all those concerned with international trade and industrial economics.

A number of individuals and institutions contributed to the elaboration of this study. Professor Helson Braga of the Foreign Trade Foundation (FUNCEX) in Rio de Janeiro assembled the basic data and made them available to us. The Brazilian Institute of Geography and Statistics (IBGE) offered us a generous amount of computer time in their facilities in Brasilia. The translation of the report from English to Portuguese was handled with exceptional competence by Paulo Leite Pratini of the Ministry of Industry and Commerce and Carlos Mussi of the ECLAC office in Brasilia. The study itself was prepared by Larry N. Willmore of ECLAC's Brasilia office; he is grateful for comments received in seminars at IPEA, the University of Brasilia, the XII ENCONTRO NACIONAL DE ECONOMIA, and the VI ENCONTRO BRASILEIRO DE ECONOMETRIA.

# INTRODUCTION

More than a decade ago CEPAL, in co-operation with IPEA, sponsored a pioneering study of the relationship between market structure and exports of manufactures in Brazil (Fajnzylber 1971). The study found that in 1968 over half of the industrial exports of Brazil were from industries with relatively low levels of concentration, i.e. from industries with large numbers of small and medium-sized firms. Data for a sample of 283 firms which exported in 1967 suggested that export performance was a decreasing function of firm size, and (except for foreign-owned firms) an increasing function of capital intensity (Fajnzylber, appendix 7).

Since the late 1960s, Brazil's exports of manufactured goods have undergone impressive growth and diversification. For this reason it is now possible to assemble a large data base which allows us, with the aid of statistical techniques of analysis, to reach quite definite conclusions concerning the effect of market structure and economic policies on export performance. The data were assembled from the returns of direct and indirect taxes that industrial corporations filed with the Brazilian government in 1978 and 1979. Nonetheless, no individual company is identified in the data base, and particular care has been taken to insure the confidentiality of data for individual firms.

The plan of the report is as follows. The first chapter consists of a non-technical summary of the main empirical findings along with a discussion of their policy implications. It is intended as a concise, self-contained report that is accessible to the general reader. Details are provided in the remaining chapters. Chapter II discusses various hypotheses to be tested that are drawn from the literature of international trade and industrial economics. Chapter III provides a description of the data base along with some nonparametric tests of the relationship between firm size and exports, and between firm size and export subsidies. The last two chapters contain the main econometric analyses: chapter IV specifies and estimates a logit model of the determinants of the probability of exporting while chapter V utilizes ordinary least squares techniques to find the determinants of inter-firm differences in the performance of exporters.

# I. SUMMARY AND CONCLUSIONS

The purpose of this study is to determine first what factors distinguish exporters from nonexporters and, secondly, what factors influence the performance of firms once they enter export markets. To accomplish this task, a vast micro data base has been assembled. It contains data for the fiscal year 1978 for 12 435 firms, 3 345 of which registered at least some exports. Only 21 firms (eight exporters) are public enterprises. Nonresident ownership of equity exceeds ten percent in 841 firms (610 exporters). These subsidiaries of transnational enterprises and joint ventures of foreign with local capital account for 33.0% of the domestic sales and 38.8% of the total exports of firms in our sample. An additional 245 firms (148 exporters) have license agreements with overseas firms which allow them access to foreign technology and trademarks.

## 1. EMPIRICAL FINDINGS

Firm size is without doubt the most important factor affecting both the probability that a firm will export and its subsequent export performance. To export even the smallest volume of output requires incurrence of the costs involved in dealing with government bureaucracies, obtaining market information, and setting up overseas sales organizations. Because of the existence of these fixed costs of exporting, larger firms are more likely to export than are small firms. However, among firms that do export, those with a small domestic market exhibit the largest ratio of exports to sales, for they have the most to gain from scale economies (cost reductions) through exports.

Both observed relationships -- the positive effect of firm size on the probability of exporting and the negative effect of size on subsequent export performance -- persist when the effect of other relevant variables are accounted for. Moreover this is true not for isolated industries, but rather for industries throughout Brazil's manufacturing sector. On average, each one percent increase in the total sales of a firm is associated with a 0.8 to 0.9 percent increase in the odds of exporting. Among exporters, each increase of one percent in domestic sales results, on average, in a decrease of 0.8 to 0.9 percent in the ratio of exports to domestic sales.

These findings regarding firm size imply that increased concentration of domestic sales in large enterprises has a **negative** effect on exports first because small firms may fail to reach the critical size required for exports and secondly because larger firms export a smaller proportion of their output. These indirect effects are quite strong and are offset only partially by positive direct effects of concentration on export performance: other things equal, very small exporters and very large enterprises export more if they are located in concentrated industries than if they are in relatively unconcentrated industries. Nonetheless, for the vast majority of firms -- over 70% of the firms in our sample -- increased concentration has no positive effect whatsoever on exports, whereas it does have a substantial, though indirect, negative effect through changes in the size distribution of firms in an industry.

Exporters use more physical plant and equipment per employee and a more skilled labor force than nonexporters. The statistical analysis of this report shows clearly, however, that this is the product of two separate relationships: i) large firms are skill- and capital-intensive compared to small firms, and ii) exporters happen also to be relatively large compared to nonexporters. Controlling for differences in firm size and other variables, increases in capital intensity and average skill levels **decrease** the probability that a firm will export. This result is consistent with the predictions of the conventional theory of international trade for a country like Brazil which is well endowed with unskilled labor, but lacks abundant capital and skilled labor.

Among firms that export, physical capital intensity (but not human skills) has a **positive** impact on export performance once account is taken of variations in domestic sales and other relevant variables. In other words, the greater the requirements of physical plant and equipment per unit of output, the greater, on average, is the volume of exports. This finding is opposite that which might be predicted by standard trade theory, but it is consistent with considerations of economies of scale in production. Investment in plant and equipment tends to be indivisible or "lumpy," so a firm using capital-intensive techniques of production requires a large market to reduce average costs to a minimum. For two firms with equal domestic sales but differing techniques of production, the one with a large investment in capital has a need to spread capital costs over a larger volume of exports than does the firm that utilizes more labor and fewer or less sophisticated machines.

Advertising expenditures show a very strong and positive relationship with both the probability of exporting and export performance. Markets in which advertising is important are "monopolistically competitive," i.e. the products sold are not standardized and firms compete with advertising and a proliferation of brand names. When local producers are protected from import competition, high prices and high profits encourage new entrants to set up production facilities, so such markets

tend also to have large numbers of plants of suboptimal size. Firms operating in protected, but monopolistically competitive markets thus have a strong incentive to export at prices below those prevailing in the local market in order to obtain economies of scale and a reduction in costs per unit of output.

State ownership appears to have a negative effect on the probability of exporting and a positive effect on export/sales ratios once this ratio is greater than zero. It is difficult to ascribe much importance to this result, however, since few firms in the sample are public enterprises.

In contrast, license agreements have a significant and positive effect on both the probability of exporting and the performance of exporters. It is sometimes thought that owners of technology and trademarks impose severe restrictions on licensees, hindering exports of such firms. For the firms in our data base, however, the existence of license agreements with overseas firms implies, on average, an increase of up to 100% in the odds that a firm will export, and an increase of 100 to 150% in subsequent exports. Licensed technology and brand names thus appear to be a prerequisite for, rather than an obstacle to, export success in Brazil.

Direct foreign investment is also associated with a larger number of exporters and a larger volume of exports even after controlling for the effect of other relevant variables such as industry, size and capital intensity. The odds that a subsidiary of a transnational enterprise or a joint venture of foreign and local capital will export is 140 to 270% greater than a comparable private firm without access to foreign technology and trademarks through ownership links or licenses. This result reflects the fact that the cost of exporting is lower for transnational firms, which have a good knowledge of foreign market conditions and often have the necessary sales organizations already in place in overseas markets. Among exporters, however, foreign ownership is associated with an increased export volume of 80 to 130%, which is similar to the effect of foreign licenses.

Tariffs and other import barriers increase the cruzeiro price of import substitutes relative to exports, encouraging firms to produce for local rather than export markets. For each percentage point increase in the ratio of domestic to import prices, the volume of exports falls by an estimated three-quarters of a percentage point. For some firms, this anti-export bias is offset by export subsidies that increase the amount of cruzeiros received for each dollar of export revenue. In addition, export performance is improved when exporters have access to a supply of inputs at international prices through the drawback provision for duty-free imports.

Export subsidies are widely used in Brazil to stimulate exports of manufactures, but the analysis of this report shows clearly that the system of subsidies discriminates against small

exporters. In general, the smaller the exporter, the smaller the rate of subsidy. This is true for aggregate manufacturing and for individual industries throughout the manufacturing sector. Most surprisingly, a total of 523 exporters -- 15.6% of the sample -- received no fiscal subsidy at all in 1978. Unsubsidized exporters are found in a wide variety of industries, and tend to be much smaller than subsidized exporters. This suggests that the cost of bureaucratic transactions may well exceed the benefit of any subsidy to which a small exporter is entitled.

## 2. POLICY IMPLICATIONS

Many policy implications follow directly from the empirical findings summarized above. Others require some elaboration. Those discussed in this section are intended to be illustrative but not comprehensive.

An important finding of the present study is the confirmation of a very strong and independent relationship between firm size and the probability of exporting in Brazil. Other things equal, the smaller the firm, the less likely it is to export a portion of its output. Given fixed costs of entering export markets, such a relationship is inevitable. Nonetheless, the **strength** of the impact of size on the probability of exporting is strongly influenced by government policy. The estimated effect of firm size on the probability of exporting is not a purely technical parameter, but rather a number that reflects the effects of government policies; it can be altered by changes in those policies. Small firms tend to operate with a less skilled labor force and with less capital-intensive methods of production than do large firms, so the fact that the impact of capital intensity on the probability of exporting is negative means that policies to promote the entry of small firms into export markets can be particularly effective.

The system of export subsidies in effect in Brazil, or at least that in effect in 1978, discriminates against the small exporter, and this no doubt discourages small firms from exporting in the first instance. More importantly, however, the bureaucracy in general operates so as to increase markedly the fixed costs of exporting. To quote a recent World Bank report:

> The general attitude of the administration (particularly of CACEX [the Foreign Trade Department of the Banco do Brasil]) toward exporting enterprises seems often to have been one of suspicion, instead of assistance and promotion. The volume of export documentation required is enormous, and CACEX operates a detailed export control system. This requires for both the exporting enterprises and CACEX large and costly bureaucracies, which may be an important reason for the concentration of exports in a comparatively limited number of large enterprises with experienced export administrations. (World Bank 1983, p. 31.)

The Brazilian government appears to be fully aware of the fact that bureaucratic controls inhibit the exports of small firms. Even the director of CACEX, Mr Carlos Viacava, has publicly criticized the "excessive centralization" of government which "hinders efforts of small and medium-sized firms to expand their exports." (**Jornal de Brasilia**, 17 February, 1984, p. 1.) To date, however, little has been done to change this situation.

The formation of trading companies or export consortia is a potentially effective way to distribute the fixed costs of exporting among a number of firms. Such organizations are particulary useful for small firms when fixed costs include the cost of dealing with a centralized bureaucracy, but neither type of organization is common in Brazil. In a supposed effort to encourage exports by small firms, the Central Bank in April 1984 passed Resolution No. 906 which reduces the minimum capital required for the formation of export consortia composed solely of small firms from 114 000 ORTN (indexed government bonds), or approximately US $ 912 000, to 11 000 ORTN, or approximately US $ 88 000. Unfortunately, however, this measure will have no impact whatsoever on new entrants into export markets, or even new entrants into export consortia, for all participants in a consortium formed under Resolution 906 must previously be members of an established consortium which has been in existence either for two years with a minimum of two million dollars in exports or for three years with a minimum of one milion dollars in exports.

A second empirical finding which is of great importance from the point of view of potential changes in economic policy is the fact that there is a very strong inverse relationship between firm size and export performance that is independent of other economic variables. This finding has two fundamental policy implications. First, any program to encourage the entry of small and medium-sized firms into export markets will have the added benefit of increasing the average export/sales ratios of Brazilian exporters. Secondly, policies which decrease industrial concentration in domestic markets will result in improved export performance because the average size of firms, as measured by domestic sales, will decrease. This positive impact of decreased concentration on exports is offset only partially by a negative effect for very large and very small firms.

The statistical analysis of this study demonstrates clearly that commercial policy has a significant and direct impact on export performance in Brazil. Import protection allows domestic prices and costs to exceed those of foreign producers and makes export markets appear unattractive to Brazilian producers. This bias against exports can be offset by export subsidies, drawback for import duties on imported inputs, and by real devaluation of the cruzeiro. Export subsidies as administered in Brazil appear to discriminate against the small firm, and duty drawback is most effective as an export stimulus for firms with little industrial value-added and a high dependence on imported inputs. Real devaluation, in contrast, stimulates exports from all firms irrespective of size or dependence on imports. The exchange rate

is thus potentially a very effective instrument of export promotion in Brazil. It has the added advantage of not provoking the imposition of countervailing duties in importing countries. In an inflationary economy such as that of Brazil, real devaluation reguires increases in the cruzeiro price of dollars to equal or exceed increases in the general price level.

Access to foreign technology and trademarks is clearly beneficial to the performance of exporters in Brazil's manufacturing sector. The findings of this paper suggest, however, that it makes no difference on average whether this access is provided by licensing agreements or by the sale of equity to transnational enterprises. Subsidiaries of transnational enterprises and joint ventures of foreign and local capital do, however, face markedly lower fixed costs of exporting; for this reason, they are more likely to export in the first instance than are comparable firms that lack these direct links to foreign markets.

## II. THEORETICAL CONSIDERATIONS

This chapter discusses the main predictions of the theory of international trade and industrial economics concerning both inter-firm and inter-industry differences in the probability of exporting and in export performance. Where relevant, the empirical findings of earlier studies are also mentioned. For ease of exposition, in this chapter and throughout the report, export performance refers solely to the export/sales ratios of exporters, i.e. to firms who have already entered export markets. It will be shown that the determinants of export performance are somewhat different from the determinants of the probability of exporting in the first instance.

### 1. SCALE ECONOMIES

Given that there are fixed costs of entering export markets, it follows that the larger the firm, the greater the probability of exporting, for these fixed costs can be spread over a larger volume of sales. Fixed costs include the costs of dealing with government bureaucracies in the exporting and importing country, of obtaining market information and of setting up a sales organization abroad. Moreover, importers often have no interest in small or irregular shipments, so a minimum size may be necessary if any exports are to be supplied at all. (See Tyler 1976, pp. 254-260 and Rapp 1976.)

Once a firm incurs the fixed cost of entering foreign markets, one can expect a negative relationship between export performance and the size of firm, where size is measured in terms of domestic sales. If exporting is motivated by a desire to achieve economies of scale, then firms with large domestic sales are likely to export a smaller proportion of their output, for they can obtain the benefits of large-scale production without incurring the extra costs associated with exporting (Glejser et al. 1980). For the same reason, firms with a large number of establishments should export more than would a single-plant firm with a similar volume of domestic sales. In addition, the existence of fixed costs of exporting gives rise to scale economies in export activities. A minimum volume of exports is often necessary to reduce unit costs to a reasonable level. This minimum looms larger in a small firm, producing a negative correlation between firm size and export-sales ratios.

Auquier (1980, pp. 205-207) notes correctly that there is an alternative explanation for an inverse relationship between firm size and export performance: Such correlation could result from product differentiation and demand factors as well as scale economies per se. If small firms produce varieties (specialty goods) that do not have mass appeal, or if small firms in an industry face more elastic domestic demand curves than their larger rivals, then it follows that among firms that export, the proportion of output exported will be larger for the small firms. In an empirical test employing data for individual firms the only way to distinguish this explanation from the scale economies hypothesis is that the latter predicts a positive partial correlation between the number of plants and export performance whereas the former would not predict, holding firm size constant, any correlation whatsoever between plant size and exports. Nevertheless, the two hypotheses are not mutually exclusive and it is possible for both simultaneously to account for greater export performance on the part of small firms.

Evidence for a **negative** relationship between firm size and export/sales ratios has been found for Belgium (Glejser et al. 1980), France (Auquier 1980), the United Kingdom (Utton 1982), Japan (Rapp 1976) and Brazil (Fajnzylber 1971, appendix 7, Silber 1978). Hirsch and Adar (1974) report a **positive** correlation between firm size and export performance for a sample of firms from Denmark, Holland and Israel, but the study has two defects: i) size was defined as total sales rather than domestic sales, and ii) it is not clear whether firms with no exports were excluded from the sample. In all of these studies, with the exception of Glejser et al., there has been insufficient control for variations in other relevant variables such as type of product, capital intensity, export subsidies and type of ownership.

## 2. CAPITAL INTENSITY

Standard (Heckscher-Ohlin) trade theory predicts a **negative** relationship between capital intensity, whether human or physical, and exports in a capital-poor, labor-rich country like Brazil. There does exist considerable aggregate evidence for Brazil in support of this hypothesis. Despite the distortions of subsidized credit, import protection and export subsidies, Brazil's imports embody, on average, more skills and physical capital than do Brazil's exports. This finding, which is based on direct and indirect requirements in production, is true for both total trade and for trade in manufactures (Tyler 1976, ch. 6, Carvalho and Haddad 1981, Rocca and Mendonca 1972, Hidalgo 1983). Tyler (1970) found, on the basis of direct requirements only, that exports of manufactures in 1965 were more capital-intensive than manufacturing production in general; but Carvalho and Haddad (1981, p. 53) show that the labor intensity of industrial exports increased markedly in the 1967-1974 period, so Tyler's conclusions may not be applicable to later years.

Conventional trade theory may be useful in predicting whether or not a firm will export in the first instance. Once the export decision has been made, however, trade theory may be of little help in explaining the proportion of output that is exported by a particular firm. An alternative hypothesis relating capital intensity to export performance can be derived from industrial economics. If scale economies are a decisive factor in the allocation of output between foreign and domestic markets, one would expect this factor to be more important, ceteris paribus, the more capital-intensive the tecniques of production employed by the firm. Investment in physical plant and equipment tends to be indivisible or "lumpy," hence a firm operating with capital-intensive techniques will tend to require a larger market to reduce average costs to a minimum. In other words, holding the size of the domestic market constant, physical capital intensity should have a positive effect on export performance. Skilled labor tends to be quite divisible compared to physical equipment, so no particular effect is predicted for human capital intensity.

## 3. ADVERTISING AND PRODUCT DIFFERENTIATION

For advertising, like capital intensity, there are two plausible hypotheses. The Dreze (1960) hypothesis predicts a negative relationship between advertising and exports because countries like Brazil which are minor participants in international trade are not "taste-makers," hence are expected to specialize in standardized manufactures which compete primarily on the basis of price. On the other hand, advertising intensity is associated with monopolistic competition, and monopolistic competition can be beneficial for exports when the domestic market is protected from import competition.

Consider a protected industry which is monopolistically competitive in the sense that there are differentiated products but freedom of entry into, as well as exit from, the industry. In international markets firms are likely to be "price-takers" which face extremely elastic demand. In the domestic market consumers regard any particular firm s product as a very imperfect substitute for competing goods produced by other firms, so demand is less than perfectly elastic. Since excess profits attract entry, in long-run equilibrium each firm in such an industry will produce, in the absence of exports, at a point where its average cost curve is tangent to the downward sloping demand curve that it faces. This results in the well-known "excess capacity theorem" of monopolistic competition in which average costs exceed those which would be experienced if output were expanded. The greater the advertising expenditures, the more differentiated the product, which in turn implies a less elastic domestic demand and greater "excess capacity." This excess capacity can be profitably utilized for export markets so long as the marginal revenue from export sales exceeds the marginal cost of production.

## 4. FOREIGN LICENSES

Licensees of foreign technology and trademarks might, due to restrictions imposed by overseas firms, be expected to show a lower propensity to export than would be the case in the absence of license agreements. On the other hand, access to foreign technology and internationally known brand names might give a firm a competitive edge in foreign markets. The effect which dominates can be determined only by empirical analysis, not by economic theory.

## 5. FOREIGN OWNERSHIP

Foreign-owned firms, because of their international connections, are expected, ceteris paribus, to be more likely to export and to have a better export performance than locally owned firms. Transnational firms have a greater knowledge of foreign market conditions than do purely local firms, and have organizations already in place in overseas markets.

## 6. INDUSTRIAL CONCENTRATION

There exists a large body of theoretical literature, supported by weak empirical evidence, that postulates a positive correlation between market power and export performance. (See White 1974, Das 1982, Pagoulatos and Sorensen 1976 and Marvel 1980.) This reasoning, which is based largely on the possibility of profitable price discrimination (dumping) seems relevant for protected markets like those of Brazil. If so, one can expect, ceteris paribus, a positive relation between concentration and exports for firms with large domestic market shares. Auquier (1980, p.211) has proposed the alternative hypothesis that "concentration, by promoting more collusive behavior on the home market, should induce more small firms to export (because they find their competitive options on domestic sales constrained)." If, at the same time, large firms take advantage of the possibility of price discrimination, higher concentration should result in a greater export volume for both dominant firms and the "competitive fringe" of small firms. The two hypotheses may thus be complementary rather than competing explanations of the effect of market structure on exports.

Two studies have predicted an inverse relation between concentration and export performance. Fajnzylber (1971, p. 101) hypothesized that a negative effect could result in Brazil from "the profitability of domestic sales for firms which operate in highly concentrated industries. One can assume that the greater the profitability of domestic sales, the less the incentive for firms to enter the competitive international market." Fajnzylber seems to have had a "satisficing" view of monopoly power in mind, but the data available to him (tables 20 and 24) were not consistent with the hypothesis. Blejser et al. (1980, pp. 508-509) predicted a negative effect for concentration in industries producing standardized commodities on the grounds that to export from from such industries "would involve increasing the demand

elasticity and becoming price-takers by weakening the oligopolistic interdependence and facility of collusion." Their empirical evidence for Belgium supports the hypothesis, but it does not seem to be applicable to the protected markets of Brazil.

## 7. COMMERCIAL POLICY

In markets with competing imports, export performance is a function of domestic prices relative to prices for export sales. Risk factors may impede a producer from exporting all of his output, even though it might be profitable to do so at a given point in time. So long as a producer is not completely specialized in the domestic or export markets, as is the case for all exporters in our sample, then increases in the domestic price relative to the export price will cause producers to reduce exports in order to sell in the more profitable domestic market. Over time, changes in both the exchange rate and commercial policy (export subsidies and import tariffs) are potentially important determinants of prices for exports and domestic sales, hence of export supply. At a point in time, the exchange rate is fixed, so inter-industry or inter-firm differences in export performance will depend soley on corresponding differences in commercial policy.

Import restrictions in many Brazilian industries have created markets in which domestic production does not compete with imports. As a result, a large number of intrinsically tradable goods have been transformed into what Tyler (1983b) has called "pseudo nontradables," but which might more accurately be described as "pseudo nonimportables." Domestic prices for these goods are determined soley by Brazilian demand and supply, or by oligopolistic collusion, or by the cost conditions of monopolistically competitive firms. Unless the markets are **internally** competitive one would not necessarily expect a negative relationship between export performance and the ratio of domestic to export prices. In concentrated industries, high prices may indicate high profits rather than high costs. In monopolistically competitive industries, firms with decreasing average costs may be able to export incremental production at prices well below those prevailing in the protected domestic market.

A large number of time-series analyses of the export supply of manufactures are now available for Brazil. All ignore changes in tariff policy, and most add changes in export subsidies to the real exchange rate variable. All researchers, without exception, have found found exports to be very responsive to changes in the real, subsidy inclusive, exchange rate. Braga and Markwald (1983, p. 723), after surveying sixteen of these studies, conclude that "there exists a consensus among economists today that unity is a reasonable value for the price-elasticity of the export supply of manufactures."

A priori, one might expect aggregate export supply to be equally responsive to changes in the exchange rate and to changes in the rate of export subsidy. Both instruments affect in a similar manner the amount of local currency received by the exporter for each dollar of export sales. They differ in that the exchange rate affects all exporters equally in the absence of differential export taxes or multiple exchange rates, whereas export subsidies are most often product or firm-specific. Pinto (1983) separated real exchange rate changes from changes in export subsidies; using 1954-1974 annual data, he found virtually no difference between the two elasticities. Tyler (1976), with quarterly data for 1963-1972, somewhat surprisingly found the subsidy elasticity to be nearly twice as great as the exchange rate elasticity. He attributed this to greater producer confidence in government support of exports when this support is manifested with subsidies, and predicted an eventual convergence over time of the two elasticities.

With the exception of the present report, there have been no studies of the export response to commercial policy at the level of the firm, and only one study at the industry level. Tyler (1983a) in a pooled cross-section and time-series regression model found the inter-industry variation in export growth to be related negatively to changes in nominal tariffs and positively to changes in export subsidies. Only the former variable was statistically significant, perhaps as a result of aggregation and the large inter-firm variation in rates of subsidy within each industry. (See chapter III of this report.)

In the regression analysis of chapter V, a measure of the degree of vertical integration (value added/output) of each firm is included as an explanatory variable for export performance. This is intended to act as a proxy for the importance of the "drawback" provision for duty-free importation of inputs used in the production of exports. Information on use of the drawback system is not available for individual firms, but in 1978, the year of our sample, over 40% of manufactured exports contained at least some inputs imported with the drawback scheme. The dollar value of these duty-free imports amounted to 27% of the value of the corresponding exports. (See Musalem 1983.) The drawback privilege is undoubtedly valuable to firms that make use of it for, despite the limited availability of data, Musalem was able to find evidence of a high elasticity of substition between imported inputs and domestically produced inputs. The availability of inputs at international prices should be most useful to the exporting firm which purchases a substantial portion of its inputs from other firms in the economy, i.e. to the firm with a low ratio of value-added to output. For this reason a negative relationship is expected, ceteris paribus, between vertical integration and export performance.

Exporters with varying degrees of vertical integration can also be affected differentially by indirect taxes, but Brazilian taxes appear to be neutral in this respect. Producers in Brazil pay a tax on industrial products known as IPI. Although the IPI

rate varies from product to product, it is effectively a value-added tax. Firms receive credits for IPI that the government has collected on inputs purchased from other firms in the economy. If a product is sold in the domestic economy, the firm pays the IPI rate for that good, less the IPI tax credits for purchased intermediate goods. As is well known, this system is neutral with respect to tax burden of firms with differing degrees of vertical integration. If a product is exported, the firm is exempted from the IPI but retains the IPI tax credits on any purchased inputs. The tax system is thus neutral as well with respect to exporters which differ in their degree of vertical integration. An exporter which purchases no inputs from the rest of the economy (100% vertically integrated) pays no IPI at all whereas an exporter which depends on outside suppliers receives a tax credit for IPI paid on purchased inputs. These border tax adjustments are not export subsidies, but rather a method of excluding the full value of exports from indirect taxation.

Tyler (1976, pp. 204-209) agrees that retention of IPI tax credits by the exporter does not constitute an export subsidy "for society as a whole," but argues that it does constitute a subsidy for the exporter, a subsidy which is paid by the suppliers of intermediate inputs:

> Greater IPI tax benefits will be accrued by products with more stages of production and lower degrees of industrial verticalization. Thus, a producer adding very little industrial value added can stand to benefit substantially from the previous IPI tax credit mechanism when he exports. In fact it is this kind of firm that stands to gain the most. A large, more vertically integrated firm that exports does not enjoy commensurate fiscal benefits via the tax credit mechanism for IPI paid on previous stages of production. (p. 209)

This is an interesting possibility, but there seems to be a logical error in the argument. The "producer adding very little value added" receives a rebate for the IPI tax that was included in the price of purchased inputs. The "more vertically integrated firm" receives less rebate because no tax was paid on inputs produced within the firm. Nonetheless, if the exporters themselves behave as if IPI tax credits were subsidies, this would be another reason to expect a negative relationship between vertical integration and export performance.

## 8. PLANT LOCATION

Plant location can also have an independent effect on export performance, particularly in such a diverse country as Brazil, and it would be interesting to test this hypothesis. Unfortunately, the necessary data for such a test were not available. The data available for the present study do contain information on the location of the head office of each firm, but this need bear no relation to the location of a firm's production facilities.

## III. DESCRIPTIVE AND NONPARAMETRIC STATISTICS

### 1. THE DATA BASE

A vast micro data base has been assembled to test the hypotheses discussed in the preceeding chapter. The full set of data consists of 15 041 firms, of which 3 562 registered exports in the fiscal year 1978. To facilitate the statistical analysis, 107 firms which recorded virtually no domestic sales were deleted from the sample, as were 2 282 firms (101 exporters) which showed negative value-added or failed to report the number of employees. Sixteen industries producing "non-tradables" such as rock, bricks and mineral water were also deleted, reducing the sample size to a total of 12 435, of which 3 345 export to foreign markets.

The main data source consists of corporate income tax returns filed in 1979. These refer to the fiscal year 1978, which varies by firm and need not coincide with the calendar year. To improve inter-firm comparability of the information, the data for firms with a fiscal year ending before December 1978 were adjusted upwards according to variations in the industrial wholesale price index. Since income tax returns do not contain employment information, these data were taken from the average levels of employment reported on the industrial product tax (IPI) forms in the calendar year 1978. Individual firms are not, of course, identified, and to insure confidentiality four-digit industries with fewer than six firms were not included in the data base.

Each firm has been allocated to the industry which accounts for the largest proportion of its total sales. There is no way of knowing the extent to which a firm produces products outside its main industry, or the extent to which the industry classification by total sales truly reflects the distribution of sales in export markets.

As shown in table 1, the vast majority of the firms in our sample are under national private ownership. Foreign ownership is a charateristic of 841 firms, where ownership is defined quite broadly as more than ten percent of total equity. An additional 245 firms have licensing agreements with overseas firms. Only 21 firms in the sample are publicly owned or "mixed" enterprises, a consequence of the deletion of highly concentrated industries from the data base.

As can be seen in table 2, foreign-owned firms account for 33% of the domestic sales and nearly 39% of the exports of firms in our sample. The participation of transnational firms is particularly high in the machinery, electrical equipment, transport equipment, rubber, pharmaceutical and cosmetics subsectors. In contrast, there is little foreign direct investment in the wood, furniture, clothing, footwear or printing subsectors. In all but seven of the 21 subsectors, transnational participation in exports exceeds participation in domestic sales. Transnationals tend to account for a larger share of value-added than of employment in each subsector. This is understandable because foreign-owned firms tend to be larger than their locally owned counterparts, and large firms are known to use quite capital- and skill-intensive techniques of production compared to small firms. There is also some tendency for the transnationals share of export subsidies to exceed their share of exports, but this may also be a result of their larger size.

Table 1

Distribution of the Sample by Subsector

| | Number of Firms | | | | |
|---|---|---|---|---|---|
| Subsector | Total | Export | Foreign License | Foreign Owner | Public Firm |
| **TOTAL** | **12 435** | **3 345** | **245** | **841** | **21** |
| Non-metallic minerals | 391 | 102 | 10 | 26 | --- |
| Basic iron and steel | 256 | 108 | 12 | 21 | 4 |
| Basic non-ferrous | 166 | 39 | 2 | 16 | --- |
| Metal products | 1 002 | 260 | 14 | 64 | --- |
| Machinery | 1 047 | 475 | 53 | 169 | --- |
| Electrical equipment | 523 | 232 | 20 | 96 | --- |
| Transport equipment | 371 | 184 | 22 | 50 | 1 |
| Wood | 528 | 122 | 4 | 6 | --- |
| Furniture | 481 | 84 | 6 | 5 | --- |
| Pulp and paper | 806 | 85 | 2 | 23 | --- |
| Rubber products | 365 | 54 | 2 | 11 | --- |
| Leather | 594 | 129 | 2 | 6 | --- |
| Chemicals | 581 | 197 | 19 | 92 | 2 |
| Pharmaceutical, cosmetics | 739 | 86 | 9 | 67 | 2 |
| Plastics | 418 | 84 | 9 | 19 | --- |
| Textiles | 859 | 377 | 26 | 56 | 1 |
| Clothing | 639 | 104 | 3 | 8 | --- |
| Footwear | 272 | 136 | 1 | 3 | --- |
| Food and tobacco | 1 715 | 332 | 13 | 53 | 4 |
| Printing | 300 | 17 | 11 | 7 | 6 |
| Other manufactures | 382 | 138 | 5 | 43 | 1 |

Source: 1978 data base.

Table 2

Participation of Foreign-Owned Firms in Total Employment, Value-Added, Domestic Sales, Exports, and Export Subsidies

(percentage)

| | Employ-ment | Value-added | Domestic Sales | Export Sales | Export Subsidies: Export Credit | Export Subsidies: Income Tax Exemption |
|---|---|---|---|---|---|---|
| TOTAL MANUFACTURING | **26.1** | **35.9** | **33.0** | **38.8** | **47.5** | **33.5** |
| Non-metallic minerals | 22.4 | 29.2 | 28.4 | 32.3 | 41.1 | 40.4 |
| Basic iron and steel | 26.4 | 37.1 | 34.9 | 18.7 | 21.3 | 17.8 |
| Basic non-ferrous | 18.2 | 24.1 | 22.4 | 38.2 | 51.1 | 23.7 |
| Metal products | 19.1 | 30.8 | 25.4 | 43.7 | 34.8 | 37.6 |
| Machinery | 34.8 | 47.1 | 43.5 | 59.5 | 52.1 | 44.8 |
| Electrical equipment | 54.7 | 66.5 | 62.4 | 80.0 | 81.4 | 58.6 |
| Transport equipment | 53.7 | 60.0 | 69.0 | 67.2 | 75.2 | 48.2 |
| Wood | 5.9 | 5.3 | 3.3 | 14.8 | 18.1 | 9.0 |
| Furniture | 4.9 | 6.3 | 5.3 | 3.1 | 3.4 | 4.5 |
| Pulp and paper | 14.6 | 21.4 | 19.1 | 22.7 | 23.2 | 32.2 |
| Rubber products | 45.1 | 67.8 | 70.7 | 83.0 | 84.4 | 88.3 |
| Leather and goods | 9.6 | 13.9 | 11.9 | 21.1 | 17.2 | 4.9 |
| Chemicals | 32.0 | 25.1 | 20.3 | 9.2 | 24.3 | 18.4 |
| Pharm., cosmetics | 46.9 | 59.0 | 54.3 | 57.9 | 48.9 | 57.8 |
| Plastics | 11.9 | 17.8 | 17.9 | 20.0 | 25.9 | 12.2 |
| Textiles | 19.5 | 27.2 | 27.4 | 36.6 | 36.2 | 45.3 |
| Clothing | 3.1 | 5.6 | 5.1 | 6.9 | 10.2 | 0.8 |
| Footwear | 2.9 | 2.7 | 4.0 | 0.9 | 1.7 | 0.0 |
| Food and tobacco | 12.6 | 20.6 | 20.4 | 30.1 | 32.5 | 28.2 |
| Printing | 4.7 | 5.6 | 4.9 | 0.1 | 0.9 | 1.7 |
| Other manufactures | 27.1 | 39.9 | 34.0 | 24.7 | 36.5 | 47.1 |

Source: 1978 data base.

Note: A foreign-owned firm is defined as one in which non-residents control more than ten percent of the equity.

## 2. FIRM SIZE AND EXPORTS

Table 3 shows the distribution of the 3345 exporters by size and by subsector. Nearly half of the exporters in the sample reported adjusted total sales in excess of 100 million cruzeiros (five and a half million dollars) in 1978. The typical exporter in the manufacturing sector is thus a large firm, large at least by Brazilian standards.

Table 4 reports the percentage of firms in the total sample represented by exporters, again by size class and by subsector. The percentage of firms which export increases steadily from less than one percent in the smallest size class to more than sixty percent for firms with total sales of more than 100 million cruzeiros. This tendency is present in each of the 21

Table 3

Distribution of Exporters by Size and Subsector
(number of firms)

| | Size Class | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | I | II | III | IV | V | VI | VII | VIII |
| **TOTAL** | **9** | **15** | **40** | **63** | **244** | **565** | **778** | **1631** |
| Non-metallic minerals | 0 | 0 | 1 | 1 | 8 | 16 | 19 | 57 |
| Basic iron and steel | 0 | 0 | 1 | 0 | 3 | 16 | 18 | 70 |
| Basic non-ferrous metals | 0 | 0 | 0 | 0 | 2 | 2 | 11 | 24 |
| Metal products | 1 | 1 | 5 | 3 | 14 | 37 | 79 | 120 |
| Machinery | 1 | 1 | 4 | 11 | 41 | 105 | 118 | 194 |
| Electrical equipment | 0 | 1 | 1 | 1 | 13 | 35 | 60 | 121 |
| Transport equipment | 0 | 1 | 1 | 1 | 13 | 30 | 30 | 108 |
| Wood | 0 | 2 | 2 | 2 | 12 | 28 | 34 | 42 |
| Furniture | 2 | 0 | 2 | 1 | 2 | 21 | 31 | 25 |
| Pulp and paper | 1 | 0 | 0 | 1 | 9 | 11 | 16 | 47 |
| Rubber products | 0 | 0 | 1 | 3 | 6 | 11 | 10 | 23 |
| Leather and leather goods | 1 | 1 | 6 | 9 | 14 | 31 | 35 | 32 |
| Chemicals | 1 | 3 | 2 | 2 | 10 | 21 | 46 | 112 |
| Pharmaceutical, cosmetics | 0 | 1 | 3 | 3 | 7 | 11 | 13 | 48 |
| Plastics | 0 | 0 | 3 | 3 | 8 | 11 | 19 | 40 |
| Textiles | 0 | 0 | 1 | 6 | 11 | 49 | 92 | 218 |
| Clothing | 0 | 4 | 1 | 4 | 12 | 27 | 25 | 31 |
| Footwear | 0 | 0 | 1 | 5 | 17 | 49 | 34 | 30 |
| Food, beverages, tobacco | 2 | 0 | 3 | 4 | 21 | 24 | 53 | 225 |
| Printing | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 13 |
| Other manufactures | 0 | 0 | 2 | 3 | 19 | 30 | 33 | 51 |

Source: 1978 data base.

Note: The size classes are defined as follows:

| | |
|---|---|
| I | Less than 2 million cruzeiros in sales. |
| II | 2 - 4 million cruzeiros in sales. |
| III | 4 - 8 million cruzeiros in sales. |
| IV | 8 - 12 million cruzeiros in sales. |
| V | 12 - 25 million cruzeiros in sales. |
| VI | 25 - 50 million cruzeiros in sales. |
| VII | 50 - 100 million cruzeiros in sales. |
| VIII | More than 100 million cruzeiros in sales. |

During 1978 the average exchange rate was 18 cruzeiros per U.S. dollar.

subsectors. It would appear, then, that increased size increases the probability that a firm will export. Size in itself is, however, no guarantee that a firm will export, and firms of quite modest size do export to foreign markets. Within each industry, the total sales of the smallest exporter is but a small percentage -- usually less than one percent -- of the sales of

Table 4

Percentage of Firms Which Export by Size and Subsector

| | Size Class | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | I | II | III | IV | V | VI | VII | VIII |
| **TOTAL** | **0.6** | **2.1** | **4.2** | **7.4** | **14.9** | **25.9** | **39.8** | **61.9** |
| Non-metallic minerals | 0 | 0 | 4.0 | 14.3 | 19.0 | 23.2 | 31.7 | 48.7 |
| Basic iron and steel | 0 | 0 | 16.7 | 0 | 15.0 | 32.0 | 32.7 | 67.3 |
| Basic non-ferrous | 0 | 0 | 0 | 0 | 6.9 | 6.7 | 36.7 | 54.5 |
| Metal products | 0.9 | 3.4 | 7.7 | 4.0 | 11.0 | 17.8 | 40.7 | 61.9 |
| Machinery | 2.0 | 4.0 | 6.2 | 15.3 | 28.3 | 41.5 | 57.6 | 84.0 |
| Electrical equipment | 0 | 6.3 | 5.9 | 5.0 | 21.0 | 28.9 | 55.6 | 74.2 |
| Transport equipment | 0 | 20.0 | 7.7 | 8.3 | 38.2 | 38.0 | 42.9 | 76.6 |
| Wood | 0 | 4.8 | 4.0 | 3.9 | 14.0 | 28.6 | 52.3 | 71.2 |
| Furniture | 2.7 | 0 | 5.9 | 2.8 | 2.5 | 21.0 | 35.2 | 61.0 |
| Pulp and paper | 0.7 | 0 | 0 | 1.4 | 6.9 | 12.0 | 25.8 | 49.5 |
| Rubber products | 0 | 0 | 2.9 | 6.8 | 13.0 | 30.6 | 29.4 | 74.2 |
| Leather, leather goods | 0.5 | 1.3 | 6.9 | 21.4 | 20.6 | 56.4 | 92.1 | 94.1 |
| Chemicals | 12.5 | 23.1 | 10.5 | 8.3 | 15.4 | 16.9 | 40.0 | 52.6 |
| Pharm., cosmetics | 0 | 1.0 | 2.7 | 5.3 | 6.5 | 17.2 | 27.1 | 53.3 |
| Plastics | 0 | 0 | 11.1 | 9.7 | 10.5 | 11.6 | 23.5 | 54.8 |
| Textiles | 0 | 0 | 5.0 | 13.3 | 12.4 | 26.8 | 48.4 | 74.9 |
| Clothing | 0 | 8.0 | 2.0 | 6.2 | 10.6 | 20.9 | 27.8 | 47.7 |
| Footwear | 0 | 0 | 8.3 | 25.0 | 36.2 | 64.5 | 69.4 | 81.1 |
| Food, tobacco | 0.8 | 0 | 2.2 | 4.3 | 12.9 | 12.5 | 20.5 | 44.3 |
| Printing | 0 | 0 | 0 | 0 | 4.7 | 0 | 4.3 | 35.1 |
| Other manufactures | 0 | 0 | 10.0 | 12.5 | 31.1 | 39.5 | 48.5 | 75.0 |

Source: 1978 data base.

Note: The size classes are defined as follows:

| | |
|---|---|
| I | Less than 2 million cruzeiros in sales. |
| II | 2 - 4 million cruzeiros in sales. |
| III | 4 - 8 million cruzeiros in sales. |
| IV | 8 - 12 million cruzeiros in sales. |
| V | 12 - 25 million cruzeiros in sales. |
| VI | 25 - 50 million cruzeiros in sales. |
| VII | 50 - 100 million cruzeiros in sales. |
| VIII | More than 100 million cruzeiros in sales. |

During 1978 the average exchange rate was 18 cruzeiros per U.S. dollar.

the largest non-exporter. Factors other than size obviously affect the decision to enter export markets, and these factors are analysed in chapter IV.

Two measures of central tendency -- the median and the mean -- are reported in table 5 for the export/sales ratios of exporters in each manufacturing subsector. For the sample as a whole, the median ratio is only four percent whereas the mean ratio is fifteen percent. This suggests a highly skewed distribution, with a large number of exporters registering very low export-sales ratios. A logarithmic transformation of the data is thus appropriate for analytical techniques, such as ordinary least squares regression, that assume a normal distribution.

Table 6 reports three correlation coefficients for exporters in the entire manufacturing sector and in each subsector. Rank correlation has been used because it does not require any assumption regarding the distribution of the underlying data. The first correlation reported, that between exports and domestic

Table 5

Export/Sales Ratios (percentages)

| | Number of firms | median | mean | Standard deviation |
|---|---|---|---|---|
| **TOTAL** | **3345** | **3.97** | **15.25** | **24.16** |
| Non-metallic minerals | 102 | 1.79 | 12.33 | 25.07 |
| Basic iron and steel | 108 | 7.49 | 17.16 | 21.30 |
| Basic non-ferrous metals | 39 | 2.18 | 12.67 | 21.26 |
| Metal products | 260 | 1.97 | 6.43 | 12.64 |
| Machinery | 475 | 4.77 | 10.64 | 15.71 |
| Electrical equipment | 232 | 2.50 | 7.56 | 13.20 |
| Transport equipment | 184 | 2.92 | 10.09 | 17.58 |
| Wood | 122 | 20.15 | 26.87 | 25.91 |
| Furniture | 84 | 1.31 | 5.44 | 11.75 |
| Pulp and paper | 85 | 0.96 | 7.44 | 17.75 |
| Rubber products | 54 | 1.56 | 5.87 | 15.49 |
| Leather and leather goods | 129 | 15.27 | 23.63 | 24.59 |
| Chemicals | 197 | 2.86 | 18.30 | 28.77 |
| Pharmaceutical and cosmetics | 86 | 1.70 | 3.82 | 6.59 |
| Plastics | 84 | 0.97 | 2.69 | 7.60 |
| Textiles | 377 | 5.25 | 14.83 | 22.16 |
| Clothing | 104 | 2.06 | 11.44 | 22.84 |
| Footwear | 136 | 48.24 | 45.21 | 35.79 |
| Food, beverages, tobacco | 332 | 14.55 | 30.15 | 32.88 |
| Printing | 17 | 0.58 | 1.72 | 2.74 |
| Other manufactures | 138 | 4.54 | 15.98 | 26.61 |

Source: 1978 data base.

sales, tends to be positive, which shows that firms which rank high in export receipts tend also to rank high in sales to the Brazilian market. But most coefficients are well below unity, which suggests that the relationship is far from perfect. The second coefficient reports the correlation between export/sales ratios and total sales. This statistic tends to be small and not significantly different from zero. When the correlation is measured between domestic sales and the export ratio, there is a negative relationship in 19 subsectors, and the negative coefficient is statistically significant in ten subsectors. Large firms in terms of domestic sales thus tend to export a smaller proportion of their total output; but the transport equipment subsector represents a significant exception to this general pattern.

Table 6

Spearman Rank Correlation Coefficients for Exporters: Exports and Domestic Sales

| | Exports and domestic sales | X/S and total sales | X/S and domestic sales |
|---|---|---|---|
| TOTAL | .295** | -.022 | -.232** |
| Non-metallic minerals | .311** | -.111 | -.189 |
| Basic iron and steel | .462** | .009 | -.191* |
| Basic non-ferrous metals | .267 | -.031 | -.161 |
| Metal products | .484** | .035 | -.061 |
| Machinery | .501** | .118* | -.018 |
| Electrical equipment | .522** | .048 | -.016 |
| Transport equipment | .623** | .281** | .171* |
| Wood | .123 | -.070 | -.440** |
| Furniture | .251* | -.177 | -.233* |
| Pulp and paper | .511** | -.076 | -.143 |
| Rubber products | .508** | .010 | -.081 |
| Leather, leather goods | .364** | .138 | -.186* |
| Chemicals | .014 | -.350** | -.524** |
| Pharmaceutical, cosmetics | .601** | -.127 | -.157 |
| Plastics | .601** | -.097 | -.131 |
| Textiles | .272** | .065 | -.174** |
| Clothing | .215* | -.031 | -.219* |
| Footwear | -.167 | -.007 | -.671** |
| Food, beverages, tobacco | .152** | -.048 | -.461** |
| Printing | .618** | .071 | .071 |
| Other manufactures | .271** | .008 | -.200* |

Source: 1978 data base.

* Coefficient is statistically significant at the .05 level in a two-tailed test.

** Coefficient is statistically significant at the .01 level in a two-tailed test.

In sum, the descriptive statistics reported here provide considerable support for the hypothesized importance of scale economies: Because of the high fixed cost of exporting, larger firms are more likely to export than are small firms. However, among the firms that do export, firms with small domestic market sales are likely to have a higher ratio of exports to sales, for they have the most to gain from scale economies (cost reductions) through exports. Nevertheless, the subsector level is rather aggregate, and we have not yet controled for variations in variables other than size which affect the probability of exporting and subsequent export performance.

## 3. FIRM SIZE AND EXPORT SUBSIDIES

Such clear evidence of a negative association between export ratios and domestic sales is somewhat surprising, for the system of export subsidies in effect in 1978 discriminated against the small firm. As reported in table 7, there is a highly significant and positive correlation between export volume and the the rate of subsidy through both the export credit (S1) and the income tax exemption (S2). Overall, the smaller the exporter, the smaller the export subsidy as a percentage of exports. This is generally true within each of the 21 subsectors as well, the only notable exceptions being basic non-ferrous metals and furniture. When the data are disaggregated to 139 industries, statistically significant, positive coefficients between export volume and the sum of S1 plus S2 are evident in 33 industries. (See appendix B.) This is more than five times the number that would be expected by chance at the level of confidence employed. Moreover, not one of the statistically significant coefficients carries a negative sign.

Our data base does not contain any information on subsidized credit received in conjunction with exports, but this financial incentive, though important, is not likely to have offset the bias against the small firm. On the contrary, it is quite likely that large firms obtain a disproportionate amount of subsidized credit.

Most interestingly, 760 exporters in the sample received no export credit in 1978, and 1 229 received no income tax reduction from their export activities. A total of 523 exporters -- 15.6% of the sample -- received no fiscal incentive at all. With the exception of the chemical subsector, unsubsidized exporters tend to be much smaller, on average, than subsidized exporters. (See table 8.) Moreover, unsubsidized exporters can be found throughout the manufacturing sector: in 106 of the 139 industries, at least one firm exported without the benefit of fiscal subsidies.

It should be emphasized that the large variation in rates of export subsidy within manufacturing industries may well reflect an equally large variation in the types of products that are exported. Each firm has been allocated to the industry which

accounts for the largest proportion of its total sales. The exports of a firm may be quite distinct from its overall sales, particularly in the case of large, multi-plant firms.

Table 7

Spearman Rank Correlation Coefficients for Exporters: Export Volume and Rate of Fiscal Subsidy

| | Rank Correlation between Exports and | | |
|---|---|---|---|
| | Total Subsidy (S) | Export Credit (S1) | Income Tax Exemption (S2) |
| TOTAL | .202** | .195** | .176** |
| Non-metallic minerals | .320** | .249* | .294** |
| Basic iron and steel | .302** | .229* | .248** |
| Basic non-ferrous metals | -.132 | -.176 | .071 |
| Metal products | .314** | .312** | .214** |
| Machinery | .228** | .239** | .110* |
| Electrical equipment | .232** | .207** | .149* |
| Transport equipment | .338** | .323** | .223** |
| Wood | .178* | .050 | .304** |
| Furniture | .125 | .143 | .050 |
| Pulp and paper | .332** | .421** | -.012 |
| Rubber products | .309* | .243 | .397** |
| Leather and leather goods | .343** | .361** | .221** |
| Chemicals | .163* | .149* | .191** |
| Pharmaceutical and cosmetics | .263* | .236* | .302** |
| Plastics | .352** | .301** | .332** |
| Textiles | .186** | .149** | .177** |
| Clothing | .272** | .227* | .419** |
| Footwear | .538** | .377** | .314** |
| Food, beverages, tobacco | .117* | .085 | .229** |
| Printing | .481* | .573* | .114 |
| Other manufactures | .208* | .162 | .233** |

Source: 1978 data base.

* Coefficient is statistically significant at the .05 level in a two-tailed test.

** Coefficient is statistically significant at the .01 level in a two-tailed test.

Note: Subsidy rate (S, S1 and S2) is defined as the ratio of subsidies to subsidy-inclusive export revenue.

Table 8

Average Size of All Exporters and Exporters with no Subsidies
(million cruzeiros)

| | Number of Firms | | Average Exports | | Average Sales | |
|---|---|---|---|---|---|---|
| | TOTAL | NOSUB | TOTAL | NOSUB | TOTAL | NOSUB |
| **TOTAL MANUFACTURING** | **3345** | **523** | **51.0** | **26.7** | **383.6** | **433.5** |
| Non-metallic minerals | 102 | 24 | 16.0 | 5.5 | 273.6 | 62.6 |
| Basic iron and steel | 108 | 7 | 89.4 | 2.8 | 878.4 | 59.1 |
| Basic non-ferrous | 39 | 5 | 43.6 | 35.1 | 475.3 | 259.4 |
| Metal products | 260 | 42 | 12.6 | 14.5 | 207.4 | 130.5 |
| Machinery | 475 | 54 | 27.3 | 5.1 | 213.8 | 71.5 |
| Electrical equipment | 232 | 24 | 38.9 | 2.4 | 418.7 | 216.0 |
| Transport equipment | 184 | 22 | 154.1 | 2.7 | 901.0 | 95.8 |
| Wood | 122 | 15 | 30.9 | 10.1 | 132.6 | 66.4 |
| Furniture | 84 | 17 | 5.4 | 0.7 | 102.2 | 50.6 |
| Pulp and paper | 85 | 20 | 27.3 | 2.0 | 331.5 | 230.7 |
| Rubber products | 54 | 16 | 27.5 | 1.3 | 525.8 | 65.4 |
| Leather and goods | 129 | 14 | 22.2 | 1.1 | 83.5 | 32.3 |
| Chemicals | 197 | 39 | 55.5 | 125.7 | 1087.4 | 3735.9 |
| Pharm., cosmetics | 86 | 25 | 12.5 | 3.8 | 507.4 | 175.5 |
| Plastics | 84 | 13 | 4.8 | 0.5 | 228.4 | 52.5 |
| Textiles | 377 | 32 | 34.3 | 4.9 | 255.4 | 95.2 |
| Clothing | 104 | 18 | 8.5 | 1.3 | 114.3 | 97.1 |
| Footwear | 136 | 17 | 36.0 | 0.2 | 81.7 | 61.1 |
| Food and tobacco | 332 | 98 | 175.1 | 72.9 | 614.0 | 415.8 |
| Printing | 17 | 4 | 8.9 | 0.3 | 427.1 | 54.5 |
| Other manufactures | 138 | 17 | 26.8 | 3.1 | 174.0 | 79.4 |

Source: 1978 data base.

Subsidization of exports via income tax exemptions is related to the rate of profit, hence indirectly to capital intensity. It is thus understandable that this subsidy discriminates against small firms, which tend to use labor-intensive techniques of production. It is not clear why the export credit (credito premio) should also discriminate against small exporters. Since the export credit in effect in 1978 varied widely by product, rates must have been lower for those products exported predominantly by small firms. In addition, bureaucratic obstacles may have made it unattractive for a small exporter to incur the cost of collecting a subsidy to which it was entitled.

## IV. LOGIT ANALYSIS OF THE PROBABILITY OF EXPORTING

### 1. THE LOGIT MODEL

In this chapter a single-equation model is used to measure the effect of economic variables on the probability that a firm will be an exporter. The equation to be estimated is

$$Y_i = P_i + u_i$$

where $P_i = 1/(1+e^{-Z_i})$;

$$Z_i = b_0 + b_1 \ln S_i + b_2 \ln K_i + b_3 ADV_i + b_4 STATE_i + b_5 LIC_i + b_6 FOR_i$$

and the disturbance $u_i$ is an independently distributed random variable with zero mean.

Yi is a dichotomous variable which takes the value of 1 if firm i exports and 0 if it does not. This type of binary choice model is referred to in the literature as logit analysis. (See Pindyck and Rubinfeld 1976, ch. 8 or Cox 1970.) The model restricts the estimated probabilities (the Pi's) to the zero-to-one interval and assumes that a change in an independent variable will have its greatest impact on the probability of exporting when P would otherwise be equal to 1/2. At very low or very high probabilities, large changes in independent variables result in only small changes in the estimated probability.

Estimation of the logit model presents two related problems. First, it is not appropriate to use ordinary least squares to estimate any equation with a dichotomous dependent variable, for the error term is heteroscedastistic, i.e. the variance of $u_i$ is not the same for all observations. Since the Yi can assume only two different values, 0 or 1, observations for which the Pi are close to 0 or 1 will have small variances whereas those close to 1/2 will have larger variances. It is possible to show that Pi(1-Pi) is a consistent estimate of the variance of the error term, so weighted least squares can be used to produce asymptotically efficient and unbiased estimates of the parameters of the model. (Kmenta 1971, pp. 425-27 and 461-62.) Secondly, the model is intrinsically nonlinear, so it is necessary to iteratively reweight the least squares results, where the weights are the reciprocals of the variances calculated from the previous iteration. In practice this means that somewhat more computer

time is required than would otherwise be the case. (SAS Institute 1982, pp. 36-37.)

The logit equation can also be expressed in the following way:

$$\ln(P_i/(1-P_i)) = b_0 + b_1 \ln S_i + b_2 \ln K_i + b_3 ADV_i + b_4 STATE_i + b_5 LIC_i + b_6 FOR_i$$

where the dependent variable is the logarithm of the odds that a firm will export. This equation cannot, of course, be estimated directly, for the logarithms of zero and infinity are undefined. Therefore the first equation is the one that was actually estimated.

The independent variable lnS refers to the size of the firm as measured by the natural logarithm of the cruzeiro value of adjusted sales. The coefficient of lnS is expected to be positive, for larger firms are more likely to export than are small firms given high fixed costs of exporting.

Capital intensity (K) is defined as cruzeiro value-added per employee. Value-added per employee is highly correlated with the capital intensity of different industries (Lary 1968) and presumably different firms as well. In addition, it is possible to divide this measure of capital intensity into human capital intensity (HK) and physical capital intensity (PHK). The former is measured as the average annual wage whereas the latter is defined as non-wage value-added per employee. These two variables could not be calculated for 21 firms, including two exporters, which failed to report their 1978 wage bill. Measured non-wage value-added was negative for 183 firms, so their physical capital intensity (PHK) was set equal to one cruzeiro. Value-added was estimated as total sales revenue plus change in inventories less purchases of raw materials, advertising, electricity, fuel and goods to be resold. The value-added of firms whose fiscal year differed from the calendar year was adjusted by the wholesale price index in order to make the statistics more comparable between firms.

In accordance with the Heckscher-Ohlin theorem, a negative coefficient is thus expected for capital intensity, whether human or physical. Nonetheless it should be emphasized that our measure of capital intensity takes no account of indirect labor requirements. It is entirely conceivable that a firm may be use capital-intensive methods of production, yet utilize large amounts of unskilled labor in the form of inputs purchased from other firms in the economy.

The advertising variable (ADV) is defined as the ratio of advertising expenditures to domestic sales. Dreze (1960) would predict a negative coefficient for this variable because countries which have little weight in world trade are expected in export markets to specialize in standardized goods which compete on the basis of price rather than advertising. As explained in chapter II, monopolistic competition in a protected domestic

market can conceivably reduce the importance of the "Dreze hypothesis" or even produce a positive coefficient.

STATE is a dummy variable which takes the value of unity if the government holds equity in the firm, and the vaue of zero otherwise. Eight of the 21 public enterpises in the sample are exporters. No particular sign is expected a priori for the coefficient of this variable.

LIC is a dummy variable which is equal to one if a firm in which residents own ninety percent or more of the equity has a licensing agreement with an overseas firm, and zero otherwise. More than half of these 245 firms registered exports in 1978. The coefficient of this variable can be negative, if overseas firms prevent licensees from competing in export markets, or positive, if access to foreign technology and trademarks gives licensees a competitive edge in exports.

FOR takes a value of one if non-resident owners hold more than ten percent of the equity of a firm, and zero if foreign ownership is ten percent or less. This variable is thus broadly defined to include joint ventures of national and foreign firms as well as foreign-controlled firms. Nearly three-quarters of the 841 firms in which foreigners held more than ten percent of the equity recorded exports in 1978. A positive coefficient is expected for this variable.

The same logit model was estimated for each manufacturing subsector, with only two changes. First, the STATE dummy was deleted due to an insufficient number of public enterprises in the sample. Secondly, the dummy variables LIC and FOR were combined into a variable labelled LICFOR which takes the value of unity if a firm has foreign licensing agreements or foreign direct investment amounting to more than ten percent of its equity, and zero otherwise.

## 2. EMPIRICAL RESULTS

Table 9 reports the mean and standard deviation of the explanatory variables for the sample as a whole as well as for the subsets of exporters and nonexporters. Exporters are clearly larger than nonexporters, utilize more skill- and capital-intensive techniques of production and exhibit a higher ratio of advertising to domestic sales. From the disaggregate data reported in appendix table C-1, it can be seen that this is generally true in each subsector as well. The only exceptions are rubber products, where exporters have low advertising ratios, and footwear, where exporters output is slightly less capital-intensive than that of nonexporters. Nonetheless, it would not be correct to conclude that each of these variables necessarily has a positive impact on the probability of exporting, for there are significant positive correlations between the explanatory variables themselves. (See table 10.) Firms that export may be relatively capital-intensive not by virtue of the fact that they

sell part of their output to foreign markets, but rather because they are large. To determine the independent effect of capital intensity on export performance, holding constant other relevant variables such as size, a multivariate approach is needed. Precisely such an approach is provided by the logit regression model.

Tables 11 and 12 report parameters for 27 equations which were estimated by iteratively reweighted least squares, the weights being the reciprocals of Pi(1-Pi). In equations 01 and 04 the intercept was held constant over all firms, whereas in the other four equations of table 11 it was allowed to vary by subsector.

a) Firm Size

The coefficient of the logarithm of sales (lnS) is positive as expected and highly significant. Its magnitude ranges from 0.8 to 0.9 in regressions employing the full sample of firms, which indicates that a ten percent increase in the size of a firm, as measured by total sales, is associated with an eight to nine percent increase in the odds of exporting (P/(1-P)). In the subsector regressions reported in table 12 the coefficient is significant in every case at the .01 level and its magnitude ranges from a low of 0.47 (chemicals) to a high of 1.67 (footwear).

Table 9

Mean and Standard Deviation of Variables in Logit Regression

| Variable | Description | Mean | Standard Deviation |
|---|---|---|---|
| lnS | ln(total sales) | 16.984 | 1.940 |
| | nonexporters | 16.418 | 1.808 |
| | exporters | 18.521 | 1.370 |
| lnK | ln(value-added per employee) | 12.154 | 0.872 |
| | nonexporters | 12.077 | 0.909 |
| | exporters | 12.365 | 0.720 |
| ADV | advertising/domestic sales | 0.007 | 0.024 |
| | nonexporters | 0.006 | 0.010 |
| | exporters | 0.010 | 0.033 |
| lnHK | ln(wage bill per employee) | 10.959 | 0.760 |
| | nonexporters | 10.868 | 0.781 |
| | exporters | 11.207 | 0.635 |
| lnPHK | ln(non-wage value-added/employee) | 11.560 | 1.736 |
| | nonexporters | 11.448 | 1.883 |
| | exporters | 11.864 | 1.201 |

Table 10

Simple Correlation between Variables in Logit Regression

| | lnS | lnK | ADV | lnHK | lnPHK |
|---|---|---|---|---|---|
| lnS | 1.000 | 0.463 | 0.066 | 0.497 | 0.340 |
| lnK | 0.463 | 1.000 | 0.051 | 0.696 | 0.734 |
| ADV | 0.066 | 0.051 | 1.000 | 0.081 | -0.006 |
| lnHK | 0.497 | 0.696 | 0.081 | 1.000 | 0.309 |
| lnPHK | 0.340 | 0.734 | -0.006 | 0.309 | 1.000 |

Note: All coefficients except that for the correlation between ADV and lnPHK (-0.006) are statistically significant at the .01 level.

b) Capital Intensity

The variable for total capital intensity (K) is highly significant and has the negative coefficient suggested by standard trade theory, but the elasticity increases markedly in absolute size from -0.35 to -0.91 when subsector dummies are included in the regression. This appears to be due to observations in the footwear subsector which are outliers with respect to this variable and others as well. In regression equation 03, which excludes the 272 footwear firms but includes 20 dummy variables, the estimated elasticity of capital intensity is only -0.34. In 19 of the 21 subsector regressions, the coefficient of capital intensity is negative, significantly so at the .05 level in a two-tailed test in nine equations. Pulp and paper is the only subsector to show a significantly positive coefficient for capital intensity.

When human capital intensity (HK) and physical capital intensity (PHK) enter the equation, both have the expected negative coefficients, but the absolute value of the coefficient of lnHK is much larger than that of lnPHK. This suggests that variations in skill intensity, as measured by average wages, have a much greater impact on the probability of exporting than do variations in physical plant and equipment. It should be noted, however, that our proxy for physical capital intensity is non-wage value-added per employee and this may cause a downward bias in the estimate of the absolute size of the coefficient of PHK. Output per worker is known to be highly correlated with capital-labor ratios, but it is also affected by total factor productivity. The small size of the "physical capital intensity" may thus reflect the positive effect of superior management on both exports and productivity.

c) Advertising Intensity

The advertising variable (ADV) carries a significantly positive coefficient in all of the equations reported in table 11. This implies that Brazilian firms producing highly advertised, hence highly differentiated, goods are more likely to export than are firms producing standardized commodities. Such a finding is opposite that predicted by the Dreze hypothesis, but it is consistent with the existence of "excess capacity" due to monopolistic competition in the protected Brazilian market.

To test whether the positive coefficient for ADV might be a product of errors in the data, 141 observations were deleted in which the advertising/domestic sales ratio was very high (8% or higher). Regression equations 01 and 02 were then re-estimated with the restricted sample. The coefficient for advertising actually increased from 5.246 to 14.043 in equation 01 and from 7.299 to 22.960 in equation 02 with little effect on the size or significance of other parameters of the model. The results reported in table 11 may thus underestimate the magnitude, though not the statistical significance, of the impact of advertising on the probability of exporting.

In the subsector regressions listed in table 12, ADV has a positive coefficent in 19 equations and a significantly positive coefficient in nine equations. In view of the fact that our expectation of a positive coefficient is based on the excess capacity theorem of the theory of monopolistic competition, it may seem strange that the highest coefficients (97.2 and 85.8) occur in basic iron and steel and in basic non-ferrous metals, subsectors with very low advertising ratios. In interpreting these subsector results it is important to recall that the data refer to firms, not plants or establishments, and each firm has been allocated to the industry which accounts for the largest proportion of its total sales. A relatively high advertising ratio for a firm in the iron and steel subsector, for example, may well be indicative of diversification, with considerable production and exports from plants operating in monopolistically competitive industries.

Equally noteworthy is the fact that the coefficient of ADV in the pharmaceutical and cosmetics subsector -- everyone's example of monopolistic competition -- is quite low (2.1) and not statistically different from zero. Three possible explanations of this result come to mind. First, advertising ratios in this subsector are quite high, so the ADV variable may be a poor indicator of inter-firm variations in "excess capacity" within the subsector. Secondly, industries in this subsector have relatively high prices, and presumably high costs, compared to foreign producers. (See appendix table D-1 of this report.) Unless sales expansion can reduce average costs to a level below export prices plus subsidies, there is no incentive to export regardless of the existence of "excess capacity." Finally, international brand names are very important for pharmaceutical products, soap and cosmetics, so export markets are likely to be as monopolistically competitive as the domestic market. In this

Table 11

Logit Analysis of the Probability of Exporting

| Variable | Regression Coefficients | | | | | |
|---|---|---|---|---|---|---|
| | 01 | 02 | 03 a/ | 04 | 05 | 06 a/ |
| Constant | -12.559** | b/ | b/ | -13.463** | b/ | b/ |
| | (0.451) | | | (0.472) | | |
| lnS | 0.896** | 0.787** | 0.970** | 0.881** | 0.803** | 0.965** |
| | (0.021) | (0.021) | (0.071) | (0.021) | (0.021) | (0.071) |
| lnK | -0.350** | -0.913** | -0.339** | | | |
| | (0.033) | (0.033) | (0.090) | | | |
| lnHK | | | | -0.193** | -0.941** | -0.263* |
| | | | | (0.040) | (0.037) | (0.111) |
| lnPHK | | | | -0.085** | -0.107** | -0.069 |
| | | | | (0.017) | (0.017) | (0.046) |
| ADV | 5.246** | 7.299** | 8.841** | 5.008** | 8.095** | 8.921** |
| | (1.096) | (1.187) | (2.996) | (1.083) | (1.230) | (3.036) |
| STATE | -1.393* | -1.028 | -0.355 | -1.396* | -0.839 | -0.237 |
| | (0.564) | (0.632) | (1.718) | (0.573) | (0.657) | (1.754) |
| LIC | 0.580** | 0.618** | 0.302 | 0.577** | 0.695** | 0.317 |
| | (0.155) | (0.159) | (0.378) | (0.154) | (0.160) | (0.378) |
| FOR | 0.941** | 1.208** | 0.874** | 0.933** | 1.301** | 0.913** |
| | (0.091) | (0.093) | (0.227) | (0.092) | (0.094) | (0.229) |
| # firms | 12 435 | 12 435 | 12 163 | 12 414 | 12 414 | 12 142 |

Note: The numbers in parentheses are the asymptotic standard errors of the estimated coefficients. A single asterisk (*) indicates that a coefficient is significantly different from zero at the .05 level of confidence and a double asterisk (**) indicates significance at the .01 level.

a/ Excludes footwear.

b/ The constant term in this regression was allowed to vary by subsector. The estimated coefficients of the 21 dummy terms are reported in appendix table C-2.

Table 12

Logit Analysis by Subsector of the Probability of Exporting

| Subsector | Regression Coefficients | | | | |
|---|---|---|---|---|---|
| | Constant | lnS | lnK | ADV | LICFOR |
| 07 Non-metallic minerals | -8.823** | 0.825** | -0.588* | 24.769* | 0.253 |
| | (2.414) | (0.121) | (0.227) | (9.771) | (0.427) |
| 08 Basic iron and steel | -12.790** | 0.861** | -0.298 | 97.242** | 0.614 |
| | (3.171) | (0.138) | (0.251) | (33.610) | (0.493) |
| 09 Basic nonfer. metals | -19.586** | 1.438** | -0.653 | 85.768** | 0.580 |
| | (5.016) | (0.275) | (0.367) | (31.877) | (0.672) |
| 10 Metal products | -11.988** | 1.044** | -0.633** | 29.660** | 1.396** |
| | (2.034) | (0.090) | (0.157) | (8.909) | (0.312) |
| 11 Machinery | -13.650** | 1.162** | -0.581** | 25.647** | 0.721** |
| | (1.999) | (0.092) | (0.137) | (6.165) | (0.218) |
| 12 Electrical equipment | -12.457** | 1.029** | -0.526** | 16.777** | 0.697* |
| | (2.616) | (0.115) | (0.182) | (5.342) | (0.280) |
| 13 Transport equipment | -10.106** | 0.735** | -0.272 | 6.950 | 0.668 |
| | (2.768) | (0.111) | (0.207) | (10.379) | (0.396) |
| 14 Wood | -18.443** | 1.288** | -0.408* | 13.675 | 0.952 |
| | (2.858) | (0.138) | (0.197) | (7.147) | (0.862) |
| 15 Furniture | -18.517** | 1.114** | -0.197 | 7.560 | 0.410 |
| | (4.070) | (0.163) | (0.341) | (9.836) | (0.715) |
| 16 Pulp and paper | -28.402** | 1.012** | 0.704** | 38.564 | 0.753 |
| | (3.250) | (0.113) | (0.220) | (22.517) | (0.544) |
| 17 Rubber | -18.247** | 1.230** | -0.337 | -46.528 | 0.013 |
| | (4.021) | (0.175) | (0.285) | (34.540) | (0.819) |
| 18 Leather | -27.980** | 1.931** | -0.435 | 50.256 | -1.283 |
| | (3.693) | (0.192) | (0.288) | (26.652) | (0.938) |
| 19 Chemicals | -6.860** | 0.473** | -0.207* | 8.427 | 0.871** |
| | (1.580) | (0.075) | (0.105) | (4.817) | (0.243) |
| 20 Pharmaceut., cosmetics | -15.459** | 0.895** | -0.179 | 2.144 | 0.776* |
| | (3.048) | (0.110) | (0.256) | (2.519) | (0.356) |
| 21 Plastics | -17.724** | 0.844** | 0.091 | 14.339 | 1.963** |
| | (3.412) | (0.137) | (0.252) | (9.612) | (0.507) |
| 22 Textiles | -19.328** | 1.202** | -0.219 | 39.629** | 0.247 |
| | (2.047) | (0.098) | (0.115) | (14.530) | (0.320) |
| 23 Clothing | -12.240** | 0.844** | -0.347 | 33.255** | 0.097 |
| | (2.659) | (0.116) | (0.188) | (10.742) | (0.693) |
| 24 Footwear | 6.271 | 1.671** | -3.006** | -3.742 | -3.686** |
| | (4.720) | (0.228) | (0.521) | (11.085) | (1.294) |
| 25 Food, tobacco | -14.697** | 0.857** | -0.174** | 0.002 | 0.177 |
| | (1.094) | (0.056) | (0.066) | (2.294) | (0.318) |
| 26 Printing | -18.648** | 1.279** | -0.616 | -5.701 | 2.967** |
| | (6.508) | (0.282) | (0.479) | (20.553) | (0.742) |
| 27 Other manuf. | -9.856** | 0.986** | -0.651** | 16.937** | 0.688 |
| | (2.849) | (0.131) | (0.190) | (5.917) | (0.410) |

Note: The statistics in parentheses are the asymptotic standard errors of the coefficients. (*) indicates significance at the .05 level of confidence and (**) at the .01 level.

case the assumption of highly elastic demand for exports would not be warranted and there would be less incentive to enter export markets.

d) State Ownership, Foreign Ownership and Licenses

The coefficient of the dummy variable STATE is negative, which indicates, other things equal, that a public enterprise is less likely to export than is a firm under private ownership. Nonetheless, the coefficient is statistically significant at the 0.05 level only when the constant term is constrained to be the same for all subsectors.

In contrast, the coefficients of LIC and FOR are significantly positive, and the latter is nearly twice as large as the former. The licensing dummy, for some unknown reason, loses statistical significance when the footwear subsector is deleted from the sample. It appears then that one can conclude with a high degree of confidence that foreign direct investment in a firm increases the odds that the firm will be an exporter, but such a positive effect from foreign licensing agreements is less certain. In the subsector regressions reported in table 12, the LICFOR dummy shows a positive coefficient in all but two subsectors -- leather and footwear -- and in these two subsectors there is a particularly low incidence of foreign licenses and foreign ownership. In only seven subsectors, however, is a positive LICFOR coefficient significant at the .05 level of confidence.

Some experimentation was done that was not successful and for this reason is not reported here. The Herfindahl index of concentration was entered into the logit regression under the assumption that small firms are induced to export from highly concentrated industries. In no case was the coefficient significantly different from zero, in contrast to the result predicted by Auquier (1980, p. 211). An attempt was also made to enter interaction terms of subsector dummies with lnS, i.e. to allow the size coefficient to vary by subsector. This specification proved to be very costly in terms of computer time, so the attempt was abandoned when convergence failed to occur within a reasonable number of iterations.

e) Illustration of the Use of the Logit Parameters

The estimated parameters of the logit equations can easily be used to calculate probabilities. Assume, for example, that one wishes to predict the probability of exporting for a firm with 1978 sales of 100 million cruzeiros (lnS = 18.421), value-added per employee of 180 thousand cruzeiros (lnK = 12.101), and no advertising, state ownership, foreign licenses or foreign owners. From equation 01, the natural logarithm of the odds of exporting is -12.559 + 0.896(18.421) - 0.350(12.101) or -0.289. Taking antilogarithms and solving for $P_i$, the probability that such a firm will export is found to be .43. If the same firm is under foreign ownership, the calculated logarithm of the odds increases by 0.941 to 0.652 and the probabililty of exporting increases to .66.

It is also possible to see how the probability of exporting for each category of firm changes as the size of firm increases, holding all other variables constant. Table 13 reports such an exercise utilizing equation 01 of table 11. If equation 02 had been used for these calculations, the effect of size would have been somewhat smaller and if equation 03 had been used it would have been larger. Table 14 reports a similar exercise for changes in capital intensity and advertising, holding size and the three dummy terms constant. It should be noted that the 10 to 14 capital intensity range corresponds to a range of 22 thousand to 1.2 million cruzeiros (approximately 1 200 to 66 800 dollars) in value-added per employee.

Table 13

Illustration of the Relationship between Size, Ownership and the Probability that a Firm will Export

| Total Sales (million cruzeiros) | Probability of Exporting | | | |
|---|---|---|---|---|
| | Public Enterprise | Private Enterprise | Foreign License | Foreign Owner |
| 4 | .01 | .04 | .07 | .10 |
| 8 | .02 | .09 | .12 | .17 |
| 12 | .03 | .10 | .17 | .23 |
| 25 | .05 | .18 | .28 | .36 |
| 50 | .09 | .29 | .42 | .51 |
| 100 | .16 | .43 | .58 | .66 |
| 200 | .26 | .59 | .72 | .78 |
| 400 | .40 | .73 | .83 | .87 |

Source: Calculated from equation 01 of table 11 with variables lnK and ADV set equal to their means (12.154 and 0.007 respectively).

Table 14

Illustration of the Relationship between Capital Intensity, Advertising and the Probability that a Firm will Export

| Advertising Intensity a/ | Capital Intensity b/ | | | | |
|---|---|---|---|---|---|
| | 10 | 11 | 12 | 13 | 14 |
| 0 | .61 | .52 | .44 | .35 | .28 |
| .01 | .62 | .54 | .45 | .37 | .29 |
| .02 | .63 | .55 | .46 | .38 | .30 |
| .04 | .66 | .58 | .49 | .40 | .32 |
| .10 | .73 | .65 | .57 | .48 | .39 |

Source: Calculated from equation 01 of table 11 with firm size set equal to 100 million cruzeiros and the dummy variables STATE, LIC and FOR set equal to zero.

a/ Ratio of advertising expenditures to domestic sales.

b/ The natural logarithm of cruzeiros of value-added per employee.

## V. REGRESSION ANALYSIS OF EXPORT PERFORMANCE

Chapter IV analyzed factors which affect a firm's decision to enter export markets. In this chapter attention is focused on a second question: Once the export decision has been made, what determines the allocation of output between foreign and domestic markets? Data for 3 345 exporters are used to test the hypotheses discussed in chapter II.

### 1. THE ORDINARY LEAST SQUARES REGRESSION MODEL

The basic model chosen for a simultaneous test of these hypotheses draws heavily on Glejser et al. (1980):

$$\ln(X_{ij}/DS_{ij}) = b_j D_j + b_k D_j \ln(DS_{ij}) + b_{279}\ln(EST_{ij}) + b_{280}\ln(K_{ij}) + b_{281}ADV_{ij} + b_{282}T_j + b_{283}S1D_{ij} + b_{284}S1_{ij} + b_{285}S2D_{ij} + b_{286}S2_{ij} + b_{287}V_j + b_{288}H_j + b_{289}STATE_{ij} + b_{290}LIC_{ij} + b_{291}FOR_{ij} + u_{ij}$$

$$i = 1, 2, \ldots, n_j \qquad n_j > 2$$

$$j = 1, 2, \ldots, 139$$

$$k = 140, 141, \ldots, 278$$

$$b_k<0 \quad b_{279}>0 \quad b_{280}=? \quad b_{281}=? \quad b_{282}<0$$

$$b_{283}>0 \quad b_{284}>0 \quad b_{285}>0 \quad b_{286}>0$$

$$b_{287}<0 \quad b_{288}>0 \quad b_{289}=? \quad b_{290}=? \quad b_{291}>0$$

where

the subscripts i and j refer to the ith firm and the jth industry, respectively;

$\ln(X_{ij}/DS_{ij})$, the dependent variable, is the natural logarithm of the ratio of exports to domestic sales, so can take any positive or negative value. The cruzeiro value of both exports and sales for those firms whose fiscal year differed from the calendar year was adjusted by

the wholesale price index for manufactures so as to make the inter-firm statistics more comparable. Export subsidies are included as a part of the export and total sales revenue.

$D_j$ is a dummy variable corresponding to one of the 139 industries to which a firm belongs;

$D_j \ln(DS_{ij})$ is the natural logarithm of sales (in cruzeiros) multiplied by the industry dummy so that bj, the size elasticity, takes a different value in each industry. In another specification of this model, this variable is replaced by ln(DSij), constraining the size elasticity to be the same for all industries.

$EST_{ij}$ is the number of establishments owned by a particular firm;

$K_{ij}$ is the value-added (in adjusted cruzeiros) per employee, a commonly used proxy for capital intensity. In another version of the model, this variable is replaced by HKij and PHKij, which is wages per employee and non-wage value-added per employee, respectively. These two variables are proxies for human and physical capital intensities. (See Lary 1968.) They could not be measured for two firms which failed to report their 1978 wage bill. Measured non-wage value-added was negative for 17 of the remaining 3 343 firms, so their physical capital intensity was set equal to one cruzeiro so that its logarithm could be defined. Value-added was estimated as total sales revenue plus value of changes in stock less purchases of raw materials, advertising, electricity, fuel and goods to be resold.

$ADV_{ij}$ is a firm's expenditures on advertising expressed as a proportion of domestic sales;

$T_j$ is the implicit tariff of an industry, measured as the excess price of domestic over import prices;

$S1D_{ij}$ is a dummy variable which takes the value of one if an exporter receives an export tax credit (credito premio) and the value of zero otherwise;

$S1_{ij}$ is the export tax credit of a firm expressed as a proportion of total export revenue, including export subsidies;

$S2D_{ij}$ is a dummy variable which takes the value of one if a firm pays reduced corporate income tax by virtue of its export activity, and the value of zero otherwise;

$S2_{ij}$ is the export credit equivalent of the reduction in taxable income expressed as a proportion of the firm's total export revenue. Export credits are taxable as income

at the standard rate of 30%, so the export credit equivalent of the reduction in taxable income due to export activity is 0.3/0.7 (=0.43) times the reduction in taxable income.

$V_{ij}$ is the ratio of value-added to total output, intended as a measure of the degree of vertical integration of the firm;

$H_j$ is the Herfindahl index of concentration of domestic sales in a particular industry, defined as the sum of the squares of market shares of the individual firms;

$STATE_{ij}$ is a dummy variable which takes the value of unity if the government holds equity in the firm, and the value of zero otherwise;

$LIC_{ij}$ is a dummy variable equal to unity if a nationally owned firm has a licensing agreement with an overseas firm, and equal to zero otherwise;

$FOR_{ij}$ takes the value of one if non-resident owners hold more than ten percent of the equity of the firm and zero if foreign ownership amounts to ten percent or less of the equity;

$u_{ij}$ is an independent error term with zero mean and constant variance. Since the variance of the dependent variable is a decreasing function of the size of the firm, the assumption of constant variance (homoscedasticity) was not expected to be realistic. Most surprisingly, analysis of the residuals of several regression equations revealed no evidence of heteroscedasticity, so no correction of the ordinary least squares results was required.

## 2. EMPIRICAL RESULTS

Table 15 lists the mean and standard deviation of the explanatory variables which enter the regression equations, and table 16 reports the simple correlation matrix for these variables. The main regression results are shown in table 17, which contains estimated coefficients for six specifications of the basic model. Equation 01 has a constant term, but excludes the industry dummies (Dj), which do enter equation 02. The 139 industry dummies are also entered along with dummy-domestic sales interaction terms in equation 03. The estimated coefficients for the industry dummies and interaction terms can be found in appendix D. Equations 04 through 06 are identical to the first three equations except that human and physical capital replace the capital intensity variable.

In general, the regression results are most satisfactory from the point of view of goodness of fit. In equation 01 all of

the estimated coefficients are significantly different from zero at the .01 level of confidence in a two-tailed test, and in equation 04 all but one coefficient is significant at this level of confidence. The industry terms add considerably to the explanatory power of the equation, for the coefficient of determination ($R^2$) increases from .33 to .79 with the addition of industry dummies, and again to .81 when the coefficient of domestic sales is allowed to vary by industry. The full model thus "explains" more than 80% of the variation of the dependent variable.

Rather than discuss each specification of the model in turn, it seems preferable to present the results by variable, as they relate to the hypotheses discussed in chapter II.

Table 15

Mean and Standard Deviation of Variables in Regression

| Variable and Description | | Mean | Standard Deviation |
|---|---|---|---|
| $\ln(X_{ij}/DS_{ij})$ | ln(ratio of exports/domestic sales) | -3.087 | (2.539) |
| $\ln DS_{ij}$ | ln(domestic sales) | 18.234 | (1.593) |
| $\ln EST_{ij}$ | ln(number of establishments) | 0.512 | (0.683) |
| $\ln K_{ij}$ | ln(value-added per employee) | 12.365 | (0.720) |
| $\ln HK_{ij}$ | ln(wage bill per employee) | 11.207 | (0.635) |
| $\ln PHK_{ij}$ | ln(non-wage value-added/employee) | 11.864 | (1.201) |
| $ADV_{ij}$ | advertising/domestic sales | 0.010 | (0.033) |
| $T_j$ | implicit tariff | 0.180 | (0.325) |
| $S1_{ij}$ | export credit/exports | 0.131 | (0.126) |
| $S2_{ij}$ | profit tax subsidy equivalent/exports | 0.022 | (0.029) |
| $V_{ij}$ | value-added/output | 0.555 | (0.161) |
| $H_j$ | Herfindahl index of concentration | 0.069 | (0.091) |
| | | | Sum |
| STATE-owned enterprises | | | 8 |
| LICensing agreements with foreign firms | | | 148 |
| FOReign participation in equity | | | 610 |

a) Scale Economies

When the coefficient of the domestic sales variable is constrained to be identical for all 139 industries, its sign is significantly negative as hypothesized. (See equations 01, 02, 04 and 05 of table 17.) The coefficient of the establishment variable is also highly significant and has the positive sign predicted by the scale economies hypothesis. Most interestingly, the absolute size of the coefficient of lnEST is considerably smaller than that of lnDS. This suggests that a doubling of the number of plants per firm has less impact on export ratios than does a 50% reduction in domestic sales. In short, there is strong evidence of the importance of economies of scale at the plant level, but the results also lend some support to the considerations of product differentiation and demand factors stressed by Auquier (1980).

Table 16

Correlation Matrix

| | lnDS | lnK | lnHK | lnPHK | ADV | T | S1 | S2 | V | H |
|---|---|---|---|---|---|---|---|---|---|---|
| ln(X/DS) | -.363 | -.004 | -.145 | .001 | .123 | -.059 | .025 | .108 | -.104 | .032 |
| lnDS | 1.000 | .305 | .366 | .230 | -.128 | -.047 | .033 | .039 | -.092 | .132 |
| lnK | .305 | 1.000 | .757 | .753 | .017 | .075 | -.063 | .145 | -.002 | .113 |
| lnHK | .366 | .757 | 1.000 | .398 | .043 | .128 | -.043 | -.049 | .060 | .063 |
| lnPHK | .230 | .753 | .398 | 1.000 | -.030 | .031 | -.035 | .176 | .034 | .060 |
| ADV | -.128 | .017 | .043 | -.030 | 1.000 | .067 | -.011 | -.002 | .016 | .077 |
| T | -.047 | .075 | .128 | .031 | .067 | 1.000 | .007 | .052 | .211 | .018 |
| S1 | .033 | -.063 | -.043 | -.035 | -.011 | .007 | 1.000 | .082 | .115 | -.011 |
| S2 | .039 | .145 | -.049 | .176 | -.002 | .052 | .082 | 1.000 | .274 | .024 |
| V | -.092 | -.002 | .060 | .034 | .016 | .211 | .115 | .274 | 1.000 | -.085 |
| H | .132 | .113 | .063 | .060 | .077 | .018 | -.011 | .024 | -.085 | 1.000 |

Note: Coefficients with an absolute value of .034 or greater are statistically significant at the .05 level and coefficients with an absolute value of .044 or greater are significant at the .01 level.

Equation 03 is a rigorous test of the scale economies hypothesis, for in this specification both the intercept and the domestic sales coefficient are allowed to vary by industry. As can be seen in appendix D, the sales elasticities are negative in 121 of the 139 industries, significantly so at the .01 level in 50 industries. In contrast, none of the positive coefficients are significantly different from zero at the .05 level of confidence. Estimated elasticities of less than -1 indicate that increasing domestic sales is associated not only with a decline in the export-sales ratio, but also with an absolute decline in export volume. It is thus noteworthy that 40 of the 139 sales elasticities in equation 03 are less than -1, eight significantly so at the .05 level of confidence. The specification of equation 06 produces almost identical results.

b) Capital Intensity

The coefficient of capital intensity is highly significant, and its positive sign is opposite that which would be predicted for Brazil by standard trade theory. Moreover, its significance is attributable solely to variations in physical capital intensity, for the coefficient of the human capital variable is small and not significantly different from zero in equations 04 through 06. This finding is consistent with the hypothesis that the influence of economies of scale overwhelms the role of factor proportions emphasized in the conventional theory of international trade. A firm with a large investment in plant and equipment requires a larger volume of exports to reduce average costs to a minimum than does a firm with the same volume of domestic sales but less capital-intensive production techniques.

The positive effect of capital intensity on export performance appears to be quite strong, but one caveat should be noted. Because of the lack of reliable data on the capital stock of each firm, our proxy for physical capital intensity is non-wage value-added per employee. Although this proxy variable is known to be highly correlated with physical plant and equipment per employee, it is not an infallible guide to capital intensity, for it is affected by total factor productivity as well as capital-labor ratios. Part of the observed "physical capital effect" might thus reflect the positive effect of superior management on both exports and productivity.

It is interesting to note that the simple correlation between capital intensity and export ratios is quite different from the partial correlation implicit in the regression equations. As can be seen in the first line of table 16, the simple correlation between the logarithm of X/DS and that of K or PHK is very low and not significantly different from zero. In contrast, the correlation between the logarithm of the wage rate (lnHK) and the logarithm of the export ratio is negative and highly significant. The multiple regression results indicate that this negative correlation, though statistically significant, is spurious and that skill levels as measured by the average wage have no independent effect on export ratios. Wage rates are positively correlated with domestic sales; firms with a high

volume of domestic sales export proportionately less not because their wages are high but rather because they can achieve economies of scale in the domestic market with less need to enter competitive international markets. Similarly, the correlation between domestic sales and physical capital intensity obscures the positive effect that the latter has on export ratios.

c) Advertising Intensity

The coefficient of advertising is highly significant and, like the capital intensity variable, its sign is opposite that which would be predicted by trade theorists (Dreze 1960). Firms producing highly advertised, hence highly differentiated products export a larger proportion of their output than do firms producing standardized manufactures. This finding is consistent with the hypothesis that firms in monopolistic competition will seek export markets because of the existence of "excess capacity" in the sense that long-run marginal costs of production are well below long-run average costs.

The advertising variable is defined as the ratio of advertising expenditures to domestic sales. Since the domestic sales term also enters the denominator of the dependent variable, the possibility exists that the coefficient for ADV is biased upwards as a result of errors in the measurement of domestic sales. To test this hypothesis, fifty observations were deleted in which the advertising/domestic sales ratio was very high (8% or more). Regression equations 01 through 03 were then re-estimated with the restricted sample of firms. In equation 01 the coefficient of ADV fell to -0.7, and was not significantly different from zero, while other coefficients were affected very little. In equations 02 and 03, however, the coefficient increased from 5.4 to 10.6 and from 8.7 to 12.2 respectively, retaining its high level of statistical significance. For the full regression model, the reported results for the advertising variable are thus quite robust.

d) Implicit Tariff Protection

In equations 01 and 04, the coefficient of the tariff variable is negative as expected and is significant at the .01 level of confidence. For each percentage point increase in the ratio of domestic to import prices, the volume of exports falls by three-quarters of a percentage point. It appears that high domestic prices by and large do reflect high production costs or serve as an incentive to supply the domestic market at the expense of exports. Protectionist commercial policies are thus a serious impediment to the export of manufactures in Brazil.

The variable Tj can also be interpreted as the cross-sectional equivalent of a real exchange rate. Over time, an aggregate index of the real value of the cruzeiro is simply the ratio of domestic prices to international prices, divided by the nominal exchange rate (cruzeiros per unit of foreign currency). At a point in time, the nominal exchange rate is the same for all firms, but industries differ in the ratio of domestic to international prices. The higher this ratio, the greater the

"overvaluation" of the cruzeiro in that industry, and the less competitive will firms be in export markets. Most interestingly, our estimated elasticity of 0.75 is only slightly lower than long-run supply elasticities calculated with time series data. (See Braga and Markwald 1983.)

Although the size of the coefficient of Tj is quite plausible, two caveats should be noted regarding the underlying data. First, the tariff data are rather aggregate, for only 77 separate tariff rates were available for the 139 industries covered in this study. (See appendix table D-1.) Secondly, calculations of the implicit tariff are based on direct price comparisons made in late 1980 and early 1981, two to three years after the relevant time period for the remainder of the explanatory variables. Data for legal tariffs are available, but these were not used because Tyler (1983b) has shown that there is widespread tariff redundancy in Brazil, and virtually no correlation whatsoever between legal and implicit tariffs.

Due to severe multicollinearity, it was not possible to estimate the regression equations which include the implicit tariff variable along with the 139 industry dummy terms. Therefore, in those equations the coefficient of Tj is constrained to take the value obtained in regressions which exclude the industry dummies.

e) Export Subsidies

The Brazilian government uses both fiscal and financial incentives as export subsidies to offset, at least in part, the anti-export bias of the system of protection. At the level of the firm, it has been possible to obtain information for only two types of fiscal incentives: S1, the export tax credit (credito premio) and S2, the export credit equivalent of the reduction in corporate income tax attributable to exports. S1 is by far the most important of the two subsidies, averaging 13.1% for the firms in our sample compared to only 2.2% for S2. The simple correlation between S1 and S2 is significant, but a relatively low .082. S1 is negatively correlated with both human and physical capital intensity, whereas S2, which is based on profits, hence indirectly on capital intensity, shows a high positive correlation with physical capital intensity. (See table 16.)

Financial incentives are omitted entirely from the regression analysis. No data are available by firm, but Musalem (1981) has estimated that the subsidy element of export financing amounted to 10.5% of total exports of manufactures in 1978. It is also impossible to obtain data by firm on the use of the drawback provision for imported inputs, but the vertical integration variable (Vij) is intended to act as a proxy for this fiscal incentive.

Both S1 and S2 enter the regression equation in two distinct ways. A dummy variable first captures the effect of the presence of any positive subsidy on export ratios. The subsidy rate itself is then entered simultaneously as a measure of the impact

of increased subsidies on export performance at the margin. This specification provides an unconstrained estimate of the marginal effect of changes in the rate of subsidy on export performance.

Table 17

Ordinary Least Squares Analysis of Export Performance

| Variable | Regression Coefficients | | | | | |
|---|---|---|---|---|---|---|
| | 01 | 02 | 03 | 04 | 05 | 06 |
| Constant | 8.254** (0.755) | a/ | a/ | 11.365** (0.756) | a/ | a/ |
| $lnDS_{ij}$ | -0.924** (0.029) | -0.823** (0.029) | a/ | -0.893** (0.029) | -0.816** (0.029) | a/ |
| $lnEST_{ij}$ | 0.561** (0.059) | 0.473** (0.057) | 0.399** (0.059) | 0.520** (0.060 | 0.461** (0.057) | 0.386** (0.059) |
| $lnK_{ij}$ | 0.420** (0.055) | 0.318** (0.057) | 0.284** (0.057) | | | |
| $lnHK_{ij}$ | | | | -0.076 (0.070) | 0.024 (0.070) | 0.003 (0.071) |
| $lnPHK_{ij}$ | | | | 0.204** (0.034) | 0.146** (0.032) | 0.133** (0.033) |
| $ADV_{ij}$ | 4.142** (1.116) | 5.417** (1.060) | 8.658** (1.410) | 4.689** (1.123) | 5.737** (1.065) | 9.040** (1.415) |
| $T_j$ | -0.780** (0.115) | -0.780 b/ | -0.780 b/ | -0.721** (0.116) | -0.721 b/ | -0.721 b/ |
| $SID_{ij}$ | 2.054** (0.113) | 1.804** (0.107) | 1.702** (0.106 | 2.068** (0.114) | 1.813** (0.107) | 1.707** (0.106) |
| $SI_{ij}$ | -2.769** (0.348) | -2.057** (0.337) | -2.086** (0.333) | -2.898** (0.349) | -2.090** (0.338) | -2.115** (0.333) |
| $S2D_{ij}$ | 0.477** (0.096) | 0.450** (0.090) | 0.446** (0.088) | 0.429** (0.097) | 0.432** (0.090) | 0.430** (0.088) |
| $S2_{ij}$ | 4.221** (1.592) | 3.301* (1.473) | 2.876* (1.460) | 4.595** (1.603) | 3.686* (1.477) | 3.173* (1.466) |
| $V_{ij}$ | -3.117** (0.244) | -1.304** (0.269) | -1.104** (0.271) | -3.214** (0.246) | -1.375** (0.271) | -1.176** (0.273) |
| $H_j$ | 1.167** (0.408) | 0.512 (0.986) | 0.229 (1.029) | 1.278** (0.409) | 0.492 (0.988) | 0.160 (1.031) |

Table 17 (continued)

| Variable | Regression Coefficients | | | | | |
|---|---|---|---|---|---|---|
| | 01 | 02 | 03 | 04 | 05 | 06 |
| $STATE_{ij}$ | 2.495** | 2.157** | 1.360 | 2.756** | 2.351** | 1.540* |
| | (0.748) | (0.718) | (0.742) | (0.752) | (0.721) | (0.745) |
| $LIC_{ij}$ | 0.803** | 0.865** | 0.732** | 0.891** | 0.903** | 0.766** |
| | (0.181) | (0.167) | (0.167) | (0.182) | (0.167) | (0.168) |
| $FOR_{ij}$ | 0.601** | 0.792** | 0.651** | 0.731** | 0.845** | 0.701** |
| | (0.105) | (0.098) | (0.099) | (0.106) | (0.099) | (0.100) |
| $R^2$ | .331 | .791 | .813 | .328 | .791 | .813 |

Note: The numbers in parentheses are the standard errors of the coefficients. (*) indicates significance at the .05 level and (**) at the .01 level.

a/ Coefficient varies by industry. See appendix tables D-2, D-3 and D-4.

b/ An a priori restriction for the coefficient of this variable was necessary because of multicollinearity.

The coefficient of S2 is significant in all equations and has the expected positive sign. In the full model (equation 03 or 06), its size implies that a one percentage point increase in the rate of subsidization through income tax reductions produces a three percent increase in export volume. This elasticity is much higher than that of the implicit tariff variable, but it should be noted that it is not significantly higher in a statistical sense.

The coefficient of S1, in contrast, is significantly negative. The net effect of the export tax credit (S1D + S1) is positive, but the marginal effect on exports of increases in the subsidy appears to be negative. Higher rates of subsidy are thus associated with reduced export volume. This unexpected finding is the product of a defect in the underlying data: S1 includes not only subsidies for exports of the current year, but also an unknown amount of accumulated subsidies for exports of previous years.

Export subsidies in the form of tax credits were originally given by state governments as well as the federal government. Because of budgetary problems, many states found themselves unable to honor their committments to exporters, so in 1977 the

federal government allowed firms to utilize half of their accumulated state credits in payment of federal IPI taxes. In 1978 this percentage was increased to 100% and in 1979 the federal government took full responsibility for all fiscal incentives to exports. Export tax credits are taxable as income in the year that they are actually used. Since the income tax data for all firms in our sample cover fiscal years ending in 1978, the use of accumulated tax credits introduces a serious distortion in the S1 variable. Export revenue is defined as inclusive of subsidies, so a firm which utilized accumulated export credits in 1978 without actually exporting in that year appears to have a subsidy rate of 100%. Firms with a small volume of exports relative to accumulated export credits can also show quite high apparent rates of subsidy. In general, for all firms utilizing accumulated export credits, the S1 variable is biased upwards, which biases downwards the estimate of the coefficient of S1.

In an attempt to improve the estimate of the effect of the export credit on export supply, 44 firms for which S1 was 40% or higher were deleted from the sample. The results are shown in equations 07 through 09 of table 18. With the removal of these outliers, the coefficient of S1 becomes positive and is significant at the .01 level in the full model. Since the coefficient is still biased downwards because of the inclusion of an unknown amount of accumulated export credits, one can safely conclude that export subsidies given in the form of tax credits are at least as efficacious as subsidies given in the form of income tax reductions.

These errors in the measurement of export subsidies also affect the measurement of exports, hence export ratios. For this reason the regression equations were re-estimated utilizing data only for the 760 firms which received no subsidies whatsoever in the form of export credits. As shown in chapter II, it is the smallest exporters which tend to receive no export credits, so this is hardly a random sample of firms; nonetheless, equation 10 in table 18 compares quite favorably with equation 01 or 07. With the addition of industry dummies, additional observations were deleted because many industries contain only one or two firms with no export credits.

In the full model with 699 firms (equation 12), the coefficient of determination is quite high (.904), but only the advertising variable is significantly different from zero. This is due to severe multicollinearity among the explanatory variables. Neither the coefficient of S2D nor that of S2, for example, are statistically signicant, but in a joint test the two variables are significant at the .01 level of confidence (F=5.38). For this type of regression model an extremely large number of observations seem to be required in order to obtain precise estimates of the parameters. Glejser et al. had a sample of only 970 firms to estimate a similar model; the "small" size of the sample may account for the multicollinearity problems that they encountered.

Table 18

The Determinants of Export Performance in Restricted Samples

| Variable | Regression Coefficients | | | | | |
|---|---|---|---|---|---|---|
| | ---export credit < 40%---- | | | -----no export credit----- | | |
| | 07 | 08 | 09 | 10 | 11 | 12 |
| Constant | 7.925** (0.762) | a/ | a/ | 4.399** (1.523) | a/ | a/ |
| $\ln DS_{ij}$ | -0.931** (0.029) | -0.813** (0.029) | a/ | -0.983** (0.063) | -0.973** (0.062) | a/ |
| $\ln EST_{ij}$ | 0.582** (0.059) | 0.477** (0.057) | 0.404** (0.058) | 0.375** (0.146) | 0.364** (0.142) | 0.274 (0.155) |
| $\ln K_{ij}$ | 0.460** (0.056) | 0.343** (0.057) | 0.303** (0.057) | 0.854** (0.102) | .316** (0.114) | 0.193 (0.121) |
| $ADV_{ij}$ | 3.938** (1.113) | 5.146** (1.050) | 8.159** (1.400) | 10.056** (2.228) | 9.777** (2.114) | 10.202** (2.529) |
| $T_j$ | -0.794** (0.115) | -0.794 b/ | -0.794 b/ | -1.171** (0.246) | -1.171 b/ | -1.171 b/ |
| $S1D_{ij}$ | 1.618** (0.131) | 1.211** (0.128) | 1.154** (0.127) | | | |
| $S1_{ij}$ | 0.258 (0.576) | 2.159** (0.609) | 1.813** (0.605) | | | |
| $S2D_{ij}$ | 0.446** (0.097) | 0.408** (0.089) | 0.402** (0.088) | 0.736** (0.235) | 0.721** (0.223) | 0.428 (0.233) |
| $S2_{ij}$ | 3.994* (1.589) | 3.138* (1.461) | 2.823* (1.448) | -0.847 (5.672) | 0.975 (5.312) | 4.738 (5.875) |
| $V_{ij}$ | -3.173** (0.246) | -1.295** (0.270) | -1.073** (0.272) | -3.710** (0.458) | -0.718 (0.554) | -0.208 (0.598) |
| $H_j$ | 1.203** (0.411) | 0.629 (0.979) | 0.406 (1.022) | 0.144 (0.864) | -3.139 (2.770) | -2.700 (2.714) |
| $STATE_{ij}$ | 2.470** (0.745) | 2.165** (0.711) | 1.432* (0.733) | 3.333** (1.282) | 3.325** (1.177) | 0.508 (1.484) |
| $LIC_{ij}$ | 0.805** (0.182) | 0.880** (0.167) | 0.742** (0.167) | 1.880 (0.565) | 0.722 (0.554) | 0.449 (0.584) |
| $FOR_{ij}$ | 0.596** (0.105) | 0.778** (0.098) | 0.635** (0.099) | 0.053 (0.295) | 0.591* (0.281) | 0.278 (0.297) |
| $R^2$ | .328 | .792 | .814 | .352 | .882 | .904 |
| # firms | 3 301 | 3 301 | 3 301 | 760 | 743 | 699 |

Table 18 (notes)

Note: The numbers in parentheses are the standard errors of the coefficients. (*) indicates significance at the .05 level and (**) at the .01 level.

a/ Coefficient varies by industry. See appendix tables D-5, D-6 and D-7.

b/ An a priori restriction for the coefficient of this variable was necessary because of multicollinearity.

f) Vertical Integration

The value-added/output variable has the expected negative sign and is highly significant in all specifications of the regression model. The more vertically integrated the firm, the less the volume of exports. This finding is consistent with the hypothesis that the drawback privilege of duty-free importation of inputs is most valuable for an exporter that relies heavily on outside suppliers for component parts and raw materials. In the full model (equation 03 or 06), each additional percentage point of production that is incorporated within the firm is associated with a one percent fall in exports.

Firms which produce final consumer goods tend to advertise more, and to be less integrated vertically than firms which produce capital or intermediate goods. Since the coefficient for advertising is positive, whereas that for vertical integration is negative, it appears that Brazilian producers demonstrate a strong competitive advantage in consumer goods.

g) Industrial Concentration

The coefficient of the Herfindahl (H) index has the expected positive sign, but is statistically significant only when industry dummies are excluded from the regression equation. As was the case with the tariff variable, this may well be the result of collinearity, with the dummy terms picking up some of the effect of market concentration. The coefficient of 1.167 in equation 01 implies that, holding other variables constant, exports increase by nearly 1.2 percent for each increase of .01 points in the H index. Does a coefficient of this magnitude indicate that concentration is beneficial for export performance? The answer is not necessarily, for other things are not constant, and there is also a very strong inverse relationship between firm size and export performance.

Suppose, for example, there to be an industry that contains ten identical single-plant firms, so that the H index is equal to $10(1/10)^2$, or 0.10. Now let the number of firms be reduced to nine, with no change in the size of the domestic market or the equality of market shares. The H index increases to $9(1/9)^2$, or

approximately 0.11, so we would expect an increase of 1.2% in exports. But the domestic sales of at least one firm must increase, and this will have a negative effect on exports of the industry. If the domestic sales of the firm which leaves the industry are distributed equally among the remaining nine firms, the domestic sales of each will increase by approximately 11% and exports on this account will fall by more than nine percent, much more than the increase attributable to increased concentration.

One might well argue that the concentration variable is not properly specified in the equations of table 17. Most of the literature on this topic implies that a positive relationship is expected between industry concentration and export performance only in the case of large firms with considerable monopoly power in the domestic market. In addition, Auquier (1980) has hypothesized that the competitive fringe should also export more, the more concentrated the market, because their domestic options are preempted by larger rivals.

These two hypotheses can be tested jointly by adding two interaction terms to the regression model: DS25ijHj and DS500ijHj. The first variable is equal to the value of the H index for the jth industry only if the ith firm of that industry reported domestic sales of 25 million cruzeiros or less; otherwise the variable is equal to zero. This sales criteria applies to 576 firms in our sample. The second interaction term takes the value of the H index of the industry corresponding to a particular firm only if the firm recorded domestic sales in excess of 500 million cruzeiros, which was the case of only 379 firms in our sample. These two variables thus measure the deviation of small and large firms from the coefficient of H estimated with data from the entire sample of 3 345 firms.

Adding the interaction terms to equation 01 produces the following result:

$$\ln(X/DS_{ij}) = \underset{(0.800)}{8.344**} - \underset{(0.032)}{0.912**}\ln(DS_{ij}) + \underset{(0.060)}{0.509**}\ln(EST_{ij})$$

$$+ \underset{(0.055)}{0.399**}\ln(K_{ij}) + \underset{(1.113)}{3.931**}ADV_{ij} - \underset{(0.115)}{0.752**}T_{j} + \underset{(0.113)}{2.063**}SID_{ij}$$

$$- \underset{(0.347)}{2.772**}S1_{ij} + \underset{(0.096)}{0.483**}S2D_{ij} + \underset{(1.589)}{3.948*}S2_{ij} - \underset{(0.243)}{3.081**}V_{ij}$$

$$- \underset{(0.508)}{0.496}H_{j} + \underset{(0.759)}{1.927*}STATE_{ij} + \underset{(0.180)}{0.756**}LIC_{ij} + \underset{(0.104)}{0.576**}FOR_{ij}$$

$$+ \underset{(0.946)}{3.439**}DS25_{ij}H_{j} + \underset{(0.826)}{3.694**}DS500_{ij}H_{j} \qquad R^2 = .337$$

It should be noted that the coefficient of Hj becomes negative, but is not significantly different from zero, whereas the coefficient for the interaction between size and concentration exceeds 3.0 and is highly significant.

Introducing the size-concentration interaction terms into the full regression model (equation 03) yields a similar result:

$$\ln(X/DS_{ij}) = a_j D_j + b_k D_j \ln(DS_{ij}) + \underset{(0.059)}{0.366^{**}} \ln(EST_{ij})$$

$$+ \underset{(0.057)}{0.279^{**}} \ln(K_{ij}) + \underset{(1.406)}{8.598^{**}} ADV_{ij} - 0.752\, T_j + \underset{(0.106)}{1.696^{**}} SID_{ij}$$

$$- \underset{(0.332)}{2.045^{**}} S1_{ij} + \underset{(0.088)}{0.448^{**}} S2D_{ij} + \underset{(1.455)}{2.843^{*}} S2_{ij} - \underset{(0.271)}{1.116^{**}} V_{ij}$$

$$- \underset{(1.054)}{0.907} H_j + \underset{(0.741)}{1.371} STATE_{ij} + \underset{(0.167)}{0.697^{**}} LIC_{ij} + \underset{(0.099)}{0.638^{**}} FOR_{ij}$$

$$+ \underset{(1.259)}{3.884^{**}} DS25_{ij} H_j + \underset{(1.225)}{3.385^{**}} DS500_{ij} H_j \qquad R^2 = .815$$

The industry dummies ($a_j$) and 139 domestic sales elasticities ($b_k$) were calculated but are not shown for reasons of space.

In sum, the results lend considerable support to the proposition that concentration induces greater export performance on the part of both large firms and the competitive fringe, while for the vast majority of firms market concentration in itself bears no relationship to exports. In addition, it should be noted that concentration can have a large effect on export performance through its effect on the size distribution of firms in an industry. This negative effect, though indirect, overwhelms the direct effects if increased concentration at the firm level is associated with increased concentration of production at the plant level as well.

h) State Ownership

No particular sign was hypothesized for the STATE dummy. It is included in the regression first because of interest in the behavior of public compared to private enterprise and secondly because public ownership may well have an independent effect on export performance. As can be seen in table 17, the coefficient of this variable is quite large, and is most often statistically significant. Ex post, it is tempting to interpret this as evidence that public enterprises have more information and a wider export horizon that private enterprises, or that they are able to sell abroad at a loss with the full knowledge that this will be covered by the state or by increased prices for domestic sales. Nonetheless, since only eight exporters in our sample are under public ownership, it is very possible that this result may not be generally applicable to public enterprises operating in Brazil's manufacturing sector.

i) Foreign Licenses

The positive and highly significant coefficient of the foreign license dummy is consisitent with the thesis that in Brazil license agreements with overseas firms are a prerequisite for, rather an obstacle to, export success. The estimated

coefficient varies from 0.7 to 0.9 depending on the specifications of the other variables, which implies that exports of resident-owned firms with licenses are two to two-and-a-half times greater than exports of similar firms operating without licensed technology or trademarks.

j) Foreign Ownership

The 610 foreign-owned firms in our sample have an average export ratio of only 11.8% compared to 16.0% for the remaining 2 735 firms. Nonetheless, the coefficient of the foreign ownership dummy is positive and highly significant. Foreign-owned firms tend to be large, and large firms export a smaller proportion of their output. Once the effect of size and other variables are accounted for, foreign-owned firms export, on average, twice the volume of comparable firms which have no access to licensed technology or trademarks.

It is interesting to note that the size of the FOR dummy differs little from that of the dummy for license agreements. It would thus appear to make no difference in terms of export performance whether foreign firms transfer their technology and trademarks through licensing arrangements or through direct investment in Brazilian companies.

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# APPENDICES

## A. INDUSTRIAL CONCENTRATION

The complete data base for this report consists of 15,041 firms, which represent nearly 6% of the total number of active manufacturing firms in 1978. Exporting firms total 3,562, or roughly two-thirds of the total number of exporters in the manufacturing sector. Those firms which registered virtually no domestic sales were deleted, reducing the sample by 107 to 14,934 firms. Each firm has been allocated to the industry which accounts for the largest proportion of its sales.

It should be emphasized that this is not a stratified sample, for small firms are under-represented. Individual firms are not, of course, identified, and to insure confidentiality four-digit industries with fewer than six firms were not included in the data base. For 179 industries, data are included for all firms with reported 1978 sales in excess of two million cruzeiros or exports greater than one million cruzeiros, i.e. approximately 100 and 50 thousand dollars, respectively.

Table A-1 shows the distribution by industry of the entire sample and the 3,455 exporters. This table reveals the extraordinary diversity of Brazilian exports: all but nine of the 179 four-digit industries registered exports in 1978.

The data have been used to calculate indices of market concentration for each of the 179 industries. This repeats the earlier work of Braga and Mascolo (1982) with two important modifications. First, many firms have a fiscal year which does not coincide with the calendar year. The cruzeiro values of sales for these firms have been inflated by the industrial wholesale price index in order to make the statistics more comparable. Secondly, exports have been deleted from total sales in order to calculate indices of concentration in the domestic market. It has not been possible to take competing imports into account, but these are of minor importance in most industries.

Table A-2 reports the Herfindahl indices of concentration for domestic sales, exports and total sales in each industry. This index is defined as the sum of the squares of market shares, so takes a value between one (a single seller) and zero. As is to be expected, export sales tend to be much more concentrated than domestic sales; in only 13 industries is the index for export sales smaller than that for domestic sales. Most surprisingly, however, in 73 industries total sales are actually less concentrated than domestic sales. This is strong evidence that the largest exporters are not, in general, the largest sellers in the domestic market.

Table A-1

Distribution of Firms in the Complete Data Base by Industry

| Code | Number of Firms | | Description |
|---|---|---|---|
| | Total | Exporters | |
| | 14 934 | 3 455 | ----TOTAL---------- |
| | | | NON-METALLIC MINERALS |
| 1010 | 36 | 8 | Stone, marble, granite |
| 1011 | 23 | | Crushed rock |
| 1020 | 24 | | Limestone |
| 1030 | 86 | 1 | Brick |
| 1040 | 100 | 40 | Ceramics |
| 1050 | 47 | 5 | Cement |
| 1060 | 117 | 11 | Cement products |
| 1070 | 55 | 21 | Glass |
| 1080 | 42 | 8 | Processed non-metallic minerals |
| 1099 | 41 | 9 | Other non-metallic minerals |
| | | | BASIC IRON AND STEEL |
| 1101 | 30 | 27 | Pig iron |
| 1102 | 6 | 3 | Primary iron and steel |
| 1103 | 12 | 9 | Primary iron alloys |
| 1104 | 45 | 23 | Steel plate, including alloys |
| 1105 | 33 | 13 | Iron and steel pipe and tubes |
| 1106 | 88 | 23 | Forged steel |
| 1107 | 27 | 8 | Steel wire |
| 1109 | 17 | 3 | Plated steel |
| | | | BASIC NON-FERROUS METALS |
| 1111 | 48 | 12 | Primary non-ferrous metals |
| 1112 | 13 | 3 | Primary non-ferrous alloys |
| 1113 | 18 | 6 | Non-ferrous metal plates |
| 1114 | 7 | 1 | Pipe and tubes of non-ferrous metals |
| 1115 | 59 | 8 | Forgings of non-ferrous metals |
| 1116 | 6 | 1 | Non-ferrous metal wire |
| 1117 | 7 | 1 | Plated non-ferrous metals |
| 1118 | 10 | 5 | Solder and anodes |
| 1119 | 7 | 2 | Precious metals |
| | | | METAL PRODUCTS |
| 1120 | 18 | 8 | Metallurgy of powders |
| 1130 | 81 | 14 | Metallic structures |
| 1140 | 112 | 27 | Products made of metal bars |
| 1150 | 101 | 17 | Metal stampings |
| 1160 | 169 | 22 | Tanks and boilers |
| 1170 | 80 | 42 | Cutlery, arms, hand tools, etc. |
| 1180 | 31 | 1 | Metal-working, galvanizing |
| 1199 | 447 | 129 | Other metal products n.e.s. |

| Code | Number of Firms | | Description |
|---|---|---|---|
| | Total | Exporters | |
| | | | MACHINERY |
| 1210 | 22 | 8 | Non-electrical industrial motors |
| 1220 | 189 | 78 | Heating and plumbing equipment |
| 1231 | 154 | 75 | Machine tools |
| 1232 | 118 | 23 | Parts and accessories for ind. machinery |
| 1240 | 140 | 66 | Agricultural machinery |
| 1251 | 186 | 93 | Elevators and other commercial machinery |
| 1253 | 6 | 4 | Office machinery, including electrical |
| 1254 | 20 | 9 | Domestic appliances |
| 1260 | 10 | 2 | Clocks and watches |
| 1270 | 26 | 16 | Tractors and earth-moving equipment |
| 1280 | 21 | 2 | Machinery and equipment repair |
| 1299 | 219 | 103 | Other machinery and equipment n.e.c. |
| | | | ELECTRICAL EQUIPMENT |
| 1310 | 63 | 35 | Electrical generating equipment |
| 1320 | 105 | 40 | Electrical material |
| 1330 | 6 | 2 | Lighting |
| 1340 | 36 | 20 | Electrical material for motor vehicles |
| 1351 | 48 | 17 | Electrical equipment for domestic use |
| 1352 | 113 | 60 | Electrical equip for commerce and ind. |
| 1353 | 6 | 2 | Electrical equip. for technical uses |
| 1370 | 81 | 26 | Electronic equipment |
| 1380 | 87 | 32 | Communications equipment |
| 1390 | 10 | 1 | Electrical equipment repair |
| | | | TRANSPORT EQUIPMENT |
| 1411 | 29 | 9 | Shipbuilding |
| 1413 | 11 | 1 | Ship repair |
| 1421 | 8 | 7 | Railway vehicles |
| 1432 | 17 | 15 | Automobiles |
| 1433 | 248 | 122 | Automobile parts, except rubber, elec. |
| 1434 | 19 | 3 | Rebuilding of automobile engines |
| 1440 | 61 | 19 | Automobile bodies, except chassis |
| 1450 | 22 | 10 | Bicycles and motorcycles |
| 1472 | 10 | 1 | Aircraft repair |
| 1480 | 14 | 4 | Other vehicles |
| 1490 | 12 | 1 | Automotive upholstery |
| | | | WOOD |
| 1510 | 301 | 68 | Lumber |
| 1520 | 89 | 8 | Wood structures |
| 1530 | 65 | 33 | Plywood and particleboard |
| 1550 | 103 | 18 | Other wood articles, except furniture |
| | | | FURNITURE |
| 1610 | 343 | 57 | Wood furniture |
| 1620 | 71 | 16 | Metal furniture |
| 1630 | 37 | 5 | Mattresses |
| 1699 | 41 | 5 | Other furniture n.e.c. except plastic |

| Code | Number of Firms | | Description |
|---|---|---|---|
| | Total | Exporters | |
| | | | PULP AND PAPER |
| 1710 | 34 | 4 | Pulp |
| 1720 | 217 | 44 | Paper and cardboard |
| 1730 | 335 | 28 | Paper articles |
| 1740 | 259 | 9 | Cardboard articles |
| 1790 | 9 | 1 | Articles of pressed fibers |
| | | | RUBBER |
| 1810 | 28 | | Natural rubber |
| 1821 | 33 | 8 | Tires and tubes |
| 1823 | 294 | 1 | Tire re-treading |
| 1830 | 40 | 7 | Rubber hose and sheets |
| 1840 | 22 | 4 | Foam rubber, except mattresses |
| 1899 | 268 | 37 | Other rubber articles except clothing or footwear |
| | | | LEATHER |
| 1910 | 278 | 93 | Leather tanning |
| 1911 | 7 | 3 | Leather finishing |
| 1930 | 97 | 11 | Luggage |
| 1999 | 250 | 25 | Other leather goods except clothing or footwear |
| | | | CHEMICALS |
| 2000 | 91 | 36 | Organic and inorganic chemicals n.e.c. |
| 2011 | 20 | 3 | Petroleum fuels and oils |
| 2012 | 26 | 10 | Basic petrochemicals |
| 2017 | 11 | 3 | Grease, other petroleum derivatives |
| 2020 | 27 | 8 | Synthetic fibers |
| 2031 | 8 | 4 | Explosives |
| 2040 | 63 | 40 | Essential oils |
| 2050 | 13 | 5 | Concentrated flavors and aromas |
| 2060 | 51 | 15 | Insecticides, disinfectants, cleansers |
| 2070 | 103 | 28 | Paint and varnish |
| 2080 | 62 | 4 | Fertilizers |
| 2099 | 169 | 44 | Other chemical products n.e.c. |
| | | | PHARMACEUTICAL |
| 2110 | 408 | 58 | Pharmaceutical products |
| | | | PERFUMES AND SOAPS |
| 2210 | 155 | 13 | Perfumes |
| 2220 | 180 | 13 | Soap and detergents |
| 2230 | 58 | 2 | Candles |
| | | | PLASTICS |
| 2310 | 21 | 6 | Plastic sheets |
| 2320 | 73 | 20 | Plastic articles for industrial use |
| 2330 | 43 | 10 | Plastic articles for domestic use, except luggage, shoes or clothing |
| 2340 | 14 | 4 | Plastic furniture |
| 2350 | 127 | 15 | Plastic packaging |

| Code | Number of Firms | | Description |
|---|---|---|---|
| | Total | Exporters | |
| 2360 | 19 | 9 | Plastic pipe and fittings |
| 2399 | 127 | 21 | Other plastic articles n.e.c. |
| | | | TEXTILES |
| 2410 | 148 | 34 | Textile fibers |
| 2420 | 484 | 232 | Knits and woven fabrics |
| 2430 | 141 | 47 | Stretch knits, elastic |
| 2440 | 35 | 14 | Pleating, embroidery, ribbons |
| 2450 | 23 | 12 | Special textiles |
| 2460 | 44 | 10 | Finished cloth and yarn |
| 2499 | 49 | 30 | Other textile products n.e.c. |
| | | | CLOTHING AND FOOTWEAR |
| 2510 | 568 | 78 | Clothing |
| 2520 | 9 | 3 | Hats |
| 2530 | 275 | 136 | Footwear |
| 2540 | 55 | 18 | Clothing accessories |
| 2599 | 38 | 6 | Other fabric articles n.e.c |
| | | | PROCESSED FOOD |
| 2601 | 431 | 15 | Coffee and grain processing plants |
| 2602 | 64 | 5 | Flour mills |
| 2603 | 180 | 1 | Coffee roasting and grinding |
| 2604 | 7 | 7 | Instant coffee and tea |
| 2605 | 30 | 4 | Maize products, except oils |
| 2606 | 16 | 1 | Cassava products |
| 2609 | 78 | 37 | Other grain mill products |
| 2610 | 67 | 23 | Preserved fruits and vegetables |
| 2620 | 207 | 44 | Meatpacking plants |
| 2621 | 73 | 9 | Meat products from meatpacking plants |
| 2622 | 25 | | Sausage and meat products not produced in meatpacking plants |
| 2629 | 8 | | Meat products n.e.c. |
| 2630 | 43 | 24 | Fish and fish products |
| 2640 | 122 | 9 | Dairy products, except ice cream |
| 2651 | 171 | 45 | Sugar |
| 2652 | 12 | 4 | Refined sugar |
| 2660 | 54 | 23 | Chocolates and candies |
| 2670 | 129 | | Bakeries |
| 2680 | 101 | 8 | Macaroni, spaghetti and noodles |
| 2691 | 72 | 51 | Vegetable oils and lard |
| 2692 | 11 | 3 | Ice cream |
| 2693 | 11 | 1 | Salt |
| 2694 | 9 | | Vinegar |
| 2698 | 51 | 3 | Prepared animal feeds |
| 2699 | 66 | 21 | Other food products, n.e.c. |

| Code | Number of Firms | | Description |
|---|---|---|---|
| | Total | Exporters | |
| | | | BEVERAGES |
| 2710 | 147 | 6 | Wine |
| 2720 | 365 | 15 | Distilled liquor |
| 2730 | 28 | 3 | Beer and malt beverages |
| 2741 | 225 | 7 | Non-alcoholic beverages |
| 2742 | 38 | | Mineral water |
| 2750 | 24 | 1 | Alcohol distillation |
| | | | TOBACCO |
| 2810 | 34 | 8 | Tobacco |
| 2820 | 8 | 5 | Cigarettes |
| 2830 | 7 | 2 | Cigars |
| 2899 | 22 | 9 | Other tobacco products |
| | | | PRINTING AND PUBLISHING |
| 2910 | 167 | 19 | Newspapers, magazines and books |
| 2920 | 187 | 8 | Commercial printing |
| 2999 | 85 | 1 | Other printing n.e.c. |
| | | | OTHER MANUFACTURES |
| 3000 | 27 | 10 | Technical and scientific instruments |
| 3011 | 7 | 1 | Artificial limbs, wheelchairs |
| 3012 | 36 | 17 | Surgical and dental supplies |
| 3021 | 8 | 2 | Photographic equipment |
| 3023 | 29 | 9 | Optical instruments |
| 3031 | 15 | 9 | Lapidary work |
| 3032 | 32 | 5 | Jewelry. |
| 3033 | 17 | 4 | Costume jewelry |
| 3041 | 6 | 4 | Musical instruments |
| 3042 | 15 | 4 | Phonograph records |
| 3050 | 20 | 5 | Brooms and brushes |
| 3060 | 20 | | Moving pictures |
| 3070 | 21 | 6 | Toys |
| 3080 | 11 | 6 | Sporting and athletic goods |
| 3099 | 176 | 56 | Other manufactured goods n.e.c. |

Source: 1978 data base.

n.e.c. = not elsewhere classified.

Table A-2

Concentration Indices for Brazilian Industries, 1978.

| Industry | Herfindahl Indices | | |
|---|---|---|---|
| | Domestic Sales | Exports | Total Sales |
| NON-METALLIC MINERALS | | | |
| 1010 | .0653 | .3086 | .0601 |
| 1011 | .1844 | ... | .1844 |
| 1020 | .1759 | ... | .1759 |
| 1030 | .1661 | 1.0000 | .1660 |
| 1040 | .0254 | .0981 | .0253 |
| 1050 | .0555 | .7932 | .0550 |
| 1060 | .1082 | .2518 | .1065 |
| 1070 | .1209 | .2158 | .1190 |
| 1080 | .0648 | .2621 | .0664 |
| 1099 | .1672 | .7821 | .1952 |
| BASIC IRON AND STEEL | | | |
| 1101 | .0991 | .2280 | .1176 |
| 1102 | .6660 | .5132 | .6158 |
| 1103 | .1143 | .1742 | .1107 |
| 1104 | .1479 | .1936 | .1480 |
| 1105 | .2157 | .1939 | .2050 |
| 1106 | .0695 | .4390 | .0732 |
| 1107 | .1842 | .4174 | .1882 |
| 1109 | .2359 | .5439 | .2365 |
| BASIC NON-FERROUS METALS | | | |
| 1111 | .1283 | .2347 | .1230 |
| 1112 | .2478 | .9761 | .2338 |
| 1113 | .2621 | .5198 | .2609 |
| 1114 | .3155 | 1.0000 | .3154 |
| 1115 | .1175 | .3951 | .1190 |
| 1116 | .6378 | 1.0000 | .6382 |
| 1117 | .3075 | 1.0000 | .3076 |
| 1118 | .2248 | .4292 | .2400 |
| 1119 | .2111 | .9485 | .2135 |
| METAL PRODUCTS | | | |
| 1120 | .1136 | .2243 | .1123 |
| 1130 | .0889 | .5422 | .1018 |
| 1140 | .0465 | .2310 | .0473 |
| 1150 | .0573 | .1623 | .0571 |
| 1160 | .0788 | .1181 | .0764 |
| 1170 | .0481 | .0789 | .0465 |
| 1180 | .0712 | 1.0000 | .0712 |
| 1199 | .0110 | .0300 | .0110 |

| Industry | Herfindahl Indices | | |
|---|---|---|---|
| | Domestic Sales | Exports | Total Sales |
| MACHINERY | | | |
| 1210 | .2492 | .3703 | .2523 |
| 1220 | .0170 | .1420 | .0167 |
| 1231 | .0303 | .1048 | .0313 |
| 1232 | .0358 | .3711 | .0375 |
| 1240 | .0900 | .2676 | .1026 |
| 1251 | .0269 | .0887 | .0264 |
| 1253 | .4391 | .4134 | .4336 |
| 1254 | .1729 | .2714 | .1679 |
| 1260 | .2058 | .9870 | .2122 |
| 1270 | .1246 | .2500 | .1332 |
| 1280 | .3225 | .7219 | .3214 |
| 1299 | .0202 | .0871 | .0222 |
| ELECTRICAL EQUIPMENT | | | |
| 1310 | .1382 | .1118 | .1291 |
| 1320 | .0281 | .0995 | .0279 |
| 1330 | .4266 | .7787 | .4358 |
| 1340 | .2450 | .5798 | .2556 |
| 1351 | .1689 | .7010 | .1752 |
| 1352 | .1230 | .3312 | .1358 |
| 1353 | .2940 | .8373 | .3023 |
| 1370 | .0906 | .2870 | .0897 |
| 1380 | .0870 | .2387 | .0837 |
| 1390 | .3377 | 1.0000 | .3371 |
| TRANSPORT EQUIPMENT | | | |
| 1411 | .1761 | .3146 | .1700 |
| 1413 | .3450 | 1.0000 | .3607 |
| 1421 | .2393 | .4209 | .2465 |
| 1432 | .1971 | .1677 | .1888 |
| 1433 | .0212 | .0728 | .0219 |
| 1434 | .0890 | .7065 | .0900 |
| 1440 | .0536 | .3993 | .0615 |
| 1450 | .1527 | .4821 | .1563 |
| 1472 | .2472 | 1.0000 | .2265 |
| 1480 | .2405 | .5640 | .2268 |
| 1490 | .2649 | 1.0000 | .2647 |
| WOOD | | | |
| 1510 | .0112 | .0412 | .0122 |
| 1520 | .0322 | .4797 | .0335 |
| 1530 | .1017 | .1851 | .1078 |
| 1550 | .0243 | .1065 | .0242 |
| FURNITURE | | | |
| 1610 | .0079 | .1634 | .0082 |
| 1620 | .0401 | .1445 | .0400 |
| 1630 | .1299 | .3541 | .1309 |
| 1699 | .1024 | .9094 | .1278 |

| Industry | Herfindahl Indices | | |
|---|---|---|---|
| | Domestic Sales | Exports | Total Sales |
| PULP AND PAPER | | | |
| 1710 | .5113 | .5175 | .3521 |
| 1720 | .0260 | .1888 | .0279 |
| 1730 | .0374 | .6219 | .0373 |
| 1740 | .0188 | .4354 | .0188 |
| 1790 | .1965 | 1.0000 | .1962 |
| RUBBER | | | |
| 1810 | .1054 | ... | .1054 |
| 1821 | .3044 | .3945 | .3081 |
| 1823 | .0101 | 1.0000 | .0100 |
| 1830 | .1055 | .1965 | .1053 |
| 1840 | .1231 | .3613 | .1230 |
| 1899 | .0249 | .2989 | .0246 |
| LEATHER | | | |
| 1910 | .0224 | .0525 | .0245 |
| 1911 | .3825 | .4018 | .3729 |
| 1930 | .0678 | .2176 | .0640 |
| 1999 | .0397 | .1542 | .0437 |
| CHEMICALS | | | |
| 2000 | .0705 | .1592 | .0661 |
| 2011 | .9469 | .9953 | .9485 |
| 2012 | .1092 | .2026 | .1079 |
| 2017 | .6404 | .6631 | .6398 |
| 2020 | .1317 | .4340 | .1326 |
| 2031 | .2528 | .3649 | .2557 |
| 2040 | .0473 | .1680 | .0700 |
| 2050 | .3409 | .3238 | .2837 |
| 2060 | .0724 | .1895 | .0723 |
| 2070 | .0532 | .4663 | .0528 |
| 2080 | .0655 | .4015 | .0655 |
| 2099 | .0555 | .1434 | .0535 |
| PHARMACEUTICAL | | | |
| 2110 | .0359 | .0871 | .0362 |
| PERFUMES AND SOAPS | | | |
| 2210 | .0885 | .2585 | .0885 |
| 2220 | .2390 | .3740 | .2368 |
| 2230 | .0626 | .9940 | .0638 |
| PLASTICS | | | |
| 2310 | .2077 | .3807 | .2094 |
| 2320 | .0430 | .3996 | .0430 |
| 2330 | .1102 | .2539 | .1106 |
| 2340 | .1441 | .3770 | .1447 |
| 2350 | .0253 | .5242 | .0252 |
| 2360 | .1972 | .5551 | .1992 |
| 2399 | .0360 | .0920 | .0360 |

| Industry | Herfindahl Indices | | |
|---|---|---|---|
| | Domestic Sales | Exports | Total Sales |
| TEXTILES | | | |
| 2410 | .0158 | .3118 | .0172 |
| 2420 | .0237 | .0205 | .0210 |
| 2430 | .0401 | .1400 | .0422 |
| 2440 | .0895 | .5318 | .0964 |
| 2450 | .1770 | .8174 | .2481 |
| 2460 | .0804 | .2942 | .0871 |
| 2499 | .1062 | .3060 | .1134 |
| CLOTHING | | | |
| 2510 | .0102 | .0905 | .0101 |
| 2520 | .2457 | .5128 | .2433 |
| 2540 | .0416 | .2331 | .0377 |
| 2599 | .0535 | .5223 | .0546 |
| FOOTWEAR | | | |
| 2530 | .0138 | .0267 | .0119 |
| PROCESSED FOOD | | | |
| 2601 | .0069 | .4153 | .0082 |
| 2602 | .0418 | .9179 | .0433 |
| 2603 | .0185 | 1.0000 | .0183 |
| 2604 | .2238 | .2097 | .2009 |
| 2605 | .5129 | .3634 | .4971 |
| 2606 | .1045 | 1.0000 | .1042 |
| 2609 | .2872 | .2112 | .2289 |
| 2610 | .1667 | .1788 | .1650 |
| 2620 | .0152 | .1066 | .0161 |
| 2621 | .0678 | .2698 | .0757 |
| 2622 | .0145 | ... | .0145 |
| 2629 | .2002 | ... | .2002 |
| 2630 | .0655 | .1607 | .0580 |
| 2640 | .1413 | .7779 | .1292 |
| 2651 | .0115 | .0658 | .0108 |
| 2652 | .2794 | .5512 | .2536 |
| 2660 | .0614 | .2886 | .0643 |
| 2670 | .0761 | .. | .0761 |
| 2680 | .0404 | .7484 | .0404 |
| 2691 | .0644 | .0746 | .0561 |
| 2692 | .8191 | .7244 | .8033 |
| 2693 | .1662 | 1.0000 | .1590 |
| 2694 | .2039 | ... | .2039 |
| 2698 | .1032 | .6242 | .1031 |
| 2699 | .0453 | .3145 | .0895 |
| BEVERAGES | | | |
| 2710 | .0404 | .3155 | .0404 |
| 2720 | .0398 | .1238 | .0397 |
| 2730 | .1577 | .5133 | .1586 |
| 2741 | .0498 | .4643 | .0516 |
| 2742 | .1570 | ... | .1570 |
| 2750 | .1812 | 1.0000 | .2064 |

| Industry | Herfindahl Indices | | |
|---|---|---|---|
| | Domestic Sales | Exports | Total Sales |
| TOBACCO | | | |
| 2810 | .1891 | .3094 | .2514 |
| 2820 | .5837 | .8051 | .5987 |
| 2830 | .6200 | .5159 | .5917 |
| 2899 | .1475 | .2193 | .1623 |
| PRINTING | | | |
| 2910 | .0491 | .3148 | .0494 |
| 2920 | .0218 | .9276 | .0228 |
| 2999 | .0359 | 1.0000 | .0360 |
| OTHER MANUFACTURES | | | |
| 3000 | .1106 | .3524 | .1106 |
| 3011 | .8402 | 1.0000 | .8465 |
| 3012 | .0816 | .2610 | .0857 |
| 3021 | .8550 | .9766 | .8683 |
| 3023 | .0689 | .4601 | .0752 |
| 3031 | .3964 | .2093 | .1686 |
| 3032 | .1521 | .3590 | .1533 |
| 3033 | .1962 | .7329 | .1895 |
| 3041 | .2614 | .4350 | .2670 |
| 3042 | .2523 | .8865 | .2670 |
| 3050 | .2261 | .3942 | .2293 |
| 3060 | .1715 | ... | .1715 |
| 3070 | .3906 | .7516 | .4042 |
| 3080 | .1469 | .3334 | .1460 |
| 3099 | .0226 | .4567 | .0385 |

Source: 1978 data base.

## B. STATISTICAL APPENDIX TO CHAPTER III

Table B-1

Definition of Subsectors

| Subsector | Industry Codes |
|---|---|
| Non-metallic minerals | 10 |
| Basic iron and steel | 110 |
| Basic non-ferrous | 111 |
| Metal products | 112-119 |
| Machinery | 12 |
| Electrical equipment | 13 |
| Transport equipment | 14 |
| Wood | 15 |
| Furniture | 16 |
| Pulp and paper | 17 |
| Rubber products | 18 |
| Leather | 19 |
| Chemicals | 20 |
| Pharmaceutical, soaps, cosmetics | 21-22 |
| Plastics | 23 |
| Textiles | 24 |
| Clothing | 251-252,254-259 |
| Footwear | 253 |
| Food and tobacco | 26-28 |
| Printing | 29 |
| Other manufactures | 30 |

Table B-2

Spearman Rank Correlation Coefficients between Volume of Exports and Rate of Fiscal Subsidy, by Industry

| Industry | Number of Firms | Rank Correlation between Exports and Total Subsidy(S) | Export Credit(S1) | Income Tax Exemption(S2) |
|---|---|---|---|---|
| TOTAL | 3 345 | .202 | .195 | .176 |
| NON-METALLIC MINERALS | | | | |
| 1010 | 8 | - | - | - |
| 1040 | 40 | .481 | .358 | .330 |
| 1050 | 5 | - | - | - |
| 1060 | 11 | - | - | - |
| 1070 | 21 | .579 | .472 | .541 |
| 1080 | 8 | - | - | - |
| 1099 | 9 | - | - | - |
| BASIC IRON AND STEEL | | | | |
| 1101 | 27 | - | - | - |
| 1102 | 3 | - | - | - |
| 1103 | 9 | - | - | - |
| 1104 | 23 | - | - | - |
| 1105 | 13 | - | - | - |
| 1106 | 23 | .591 | .615 | - |
| 1107 | 7 | - | - | - |
| 1109 | 3 | - | - | - |
| BASIC NON-FERROUS METALS | | | | |
| 1111 | 12 | - | - | - |
| 1112 | 3 | - | - | - |
| 1113 | 6 | - | - | - |
| 1114-1117 | 11 | - | - | - |
| 1118-1119 | 7 | - | - | - |
| METAL PRODUCTS | | | | |
| 1120 | 8 | - | - | - |
| 1130 | 14 | - | - | - |
| 1140 | 27 | - | - | - |
| 1150 | 17 | .536 | .521 | .504 |
| 1160 | 22 | - | - | - |
| 1170 | 42 | .542 | .549 | .528 |
| 1180,1199 | 130 | .182 | - | .185 |
| MACHINERY | | | | |
| 1210 | 8 | .738 | - | - |
| 1220 | 77 | .304 | - | .376 |
| 1231 | 74 | - | - | - |
| 1232 | 23 | .460 | .432 | .510 |
| 1240 | 66 | .405 | .411 | - |
| 1251 | 93 | - | - | - |

| Industry | Number of Firms | Rank Correlation between Exports and Total Subsidy($) | Export Credit($1) | Income Tax Exemption($2) |
|---|---|---|---|---|
| 1253 | 4 | - | - | - |
| 1254,1260 | 11 | .615 | .597 | .861 |
| 1270 | 16 | - | - | - |
| 1280,1299 | 103 | .195 | .251 | - |
| ELECTRICAL EQUIPMENT | | | | |
| 1310 | 35 | - | .335 | - |
| 1320,1330 | 41 | - | - | - |
| 1340 | 20 | - | - | - |
| 1351 | 17 | - | - | - |
| 1352-1353 | 62 | .294 | - | - |
| 1370 | 25 | .433 | - | .425 |
| 1380 | 32 | - | - | - |
| TRANSPORT EQUIPMENT | | | | |
| 1411 | 9 | - | - | - |
| 1421 | 7 | - | - | - |
| 1432 | 15 | - | .618 | - |
| 1433 | 122 | .452 | .326 | .445 |
| 1434 | 3 | - | - | - |
| 1440 | 19 | - | - | - |
| 1450 | 9 | - | - | - |
| WOOD | | | | |
| 1510 | 65 | .406 | - | .482 |
| 1520 | 7 | - | - | - |
| 1530 | 33 | - | - | - |
| 1550 | 17 | - | - | - |
| FURNITURE | | | | |
| 1610 | 57 | - | - | - |
| 1620 | 16 | - | - | .634 |
| 1630 | 5 | - | - | - |
| 1699 | 6 | - | .880 | - |
| PULP AND PAPER | | | | |
| 1710 | 4 | - | - | - |
| 1720 | 44 | .312 | .397 | - |
| 1730 | 27 | .382 | .491 | - |
| 1740,1790 | 10 | - | - | - |
| RUBBER PRODUCTS | | | | |
| 1821 | 8 | - | - | - |
| 1830 | 7 | - | - | - |
| 1840 | 4 | - | - | - |
| 1899 | 35 | .349 | - | .346 |
| LEATHER | | | | |
| 1910-1911 | 94 | .381 | .455 | - |
| 1930 | 11 | - | - | - |
| 1999 | 24 | .617 | .489 | .489 |

| Industry | Number of Firms | Rank Correlation between Exports and Total Subsidy(S) | Export Credit(S1) | Income Tax Exemption(S2) |
|---|---|---|---|---|
| CHEMICALS | | | | |
| 2000 | 36 | - | - | - |
| 2011 | 3 | - | - | - |
| 2012 | 10 | - | - | - |
| 2017 | 3 | - | - | - |
| 2020 | 8 | - | - | - |
| 2031 | 4 | - | - | - |
| 2040 | 39 | - | - | .373 |
| 2050 | 5 | - | - | - |
| 2060 | 15 | - | - | .600 |
| 2070 | 28 | .453 | - | .620 |
| 2080 | 3 | - | - | - |
| 2099 | 43 | .344 | - | .405 |
| PHARMACEUTICAL, COSMETICS AND SOAPS | | | | |
| 2110 | 58 | .386 | .379 | .349 |
| 2210 | 13 | - | - | - |
| 2220,2230 | 15 | - | - | - |
| PLASTICS | | | | |
| 2310 | 6 | - | - | - |
| 2320 | 20 | - | - | - |
| 2330 | 10 | .784 | - | .725 |
| 2340 | 4 | - | - | - |
| 2350 | 14 | - | - | - |
| 2360 | 9 | - | - | - |
| 2399 | 21 | - | - | - |
| TEXTILES | | | | |
| 2410 | 32 | - | - | .403 |
| 2420 | 232 | .228 | .165 | .199 |
| 2430 | 47 | - | - | - |
| 2440 | 14 | - | - | - |
| 2450 | 12 | - | - | - |
| 2460 | 10 | - | - | - |
| 2499 | 30 | - | - | - |
| CLOTHING | | | | |
| 2510,2520 | 80 | - | - | .380 |
| 2540 | 18 | .543 | .491 | .702 |
| 2599 | 6 | - | - | - |
| FOOTWEAR | | | | |
| 2530 | 136 | .538 | .377 | .314 |
| FOOD | | | | |
| 2601 | 8 | - | - | - |
| 2602 | 4 | - | .949 | - |
| 2603,2604 | 8 | .833 | - | .810 |
| 2605,2606 | 5 | - | - | - |
| 2609 | 35 | - | - | - |

| Industry | Number of Firms | Rank Correlation between Exports and Total Subsidy(S) | Export Credit(S1) | Income Tax Exemption(S2) |
|---|---|---|---|---|
| 2610 | 22 | .562 | .532 | - |
| 2620 | 32 | .401 | .401 | - |
| 2621 | 9 | - | - | - |
| 2630 | 19 | - | - | - |
| 2640 | 9 | - | - | - |
| 2651,2652 | 36 | - | - | - |
| 2660 | 23 | .486 | .482 | .477 |
| 2680 | 6 | - | - | - |
| 2691 | 51 | - | - | .411 |
| 2692 | 3 | - | - | - |
| 2698 | 3 | - | - | - |
| 2699 | 19 | - | - | .602 |
| BEVERAGES | | | | |
| 2710 | 6 | - | - | - |
| 2720 | 15 | - | - | - |
| 2730 | 3 | - | - | - |
| 2741 | 6 | - | - | - |
| TOBACCO | | | | |
| 2810,2820,2830,2899 | 10 | - | - | - |
| PRINTING | | | | |
| 2910 | 8 | - | - | - |
| 2920,2999 | 9 | - | .785 | - |
| OTHER MANUFACTURES | | | | |
| 3000 | 10 | - | - | - |
| 3011-3012 | 18 | - | .524 | - |
| 3021,3023 | 11 | - | - | - |
| 3031 | 9 | - | - | - |
| 3032 | 5 | - | - | - |
| 3033 | 4 | - | - | - |
| 3041 | 4 | - | - | - |
| 3042 | 4 | - | - | 1.000 |
| 3050 | 5 | - | - | - |
| 3070 | 6 | - | - | - |
| 3080 | 6 | .943 | .812 | - |
| 3099 | 56 | - | - | .366 |

Note: A dash (-) indicates that the coefficient is not significantly different from zero at the five per cent level of *confidence in a two-tailed test.*

S1 = ratio of export credit (credito premio) to subsidy-inclusive export revenue.
S2 = ratio of subsidy equivalent of the income tax reduction to subsidy-inclusive export revenue.
S = S1 + S2.

Source: 1978 data base.

## C. STATISTICAL APPENDIX TO CHAPTER IV

Table C-1

Mean Values by Subsector of Variables in Logit Regression

| | lnS | lnK | ADV | lnHK | lnPHK |
|---|---|---|---|---|---|
| **TOTAL** | **16.984** | **12.154** | **0.007** | **10.959** | **11.560** |
| nonexporters | 16.418 | 12.077 | 0.006 | 10.868 | 11.448 |
| exporters | 18.521 | 12.365 | 0.010 | 11.207 | 11.864 |
| **Non-metallic minerals** | **17.288** | **12.070** | **0.006** | **10.936** | **11.471** |
| nonexporters | 16.812 | 12.018 | 0.005 | 10.875 | 11.374 |
| exporters | 18.638 | 12.216 | 0.010 | 11.111 | 11.744 |
| **Basic iron and steel** | **18.258** | **12.287** | **0.004** | **11.218** | **11.440** |
| nonexporters | 17.565 | 12.185 | 0.002 | 11.170 | 11.113 |
| exporters | 19.208 | 12.426 | 0.007 | 11.282 | 11.885 |
| **Basic non-ferrous** | **17.546** | **12.351** | **0.004** | **11.146** | **11.849** |
| nonexporters | 17.067 | 12.287 | 0.003 | 11.065 | 11.763 |
| exporters | 19.108 | 12.562 | 0.005 | 11.408 | 12.129 |
| **Metal products** | **17.061** | **12.170** | **0.005** | **11.067** | **11.581** |
| nonexporters | 16.575 | 12.125 | 0.004 | 10.997 | 11.508 |
| exporters | 18.448 | 12.297 | 0.008 | 11.267 | 11.787 |
| **Machinery** | **17.414** | **12.516** | **0.009** | **11.451** | **11.840** |
| nonexporters | 16.677 | 12.474 | 0.007 | 11.357 | 11.713 |
| exporters | 18.303 | 12.566 | 0.011 | 11.564 | 11.992 |
| **Electrical equipment** | **17.814** | **12.389** | **0.009** | **11.270** | **11.782** |
| nonexporters | 17.068 | 12.356 | 0.008 | 11.190 | 11.699 |
| exporters | 18.749 | 12.431 | 0.011 | 11.370 | 11.886 |
| **Transport equipment** | **18.056** | **12.265** | **0.006** | **11.261** | **11.627** |
| nonexporters | 17.181 | 12.187 | 0.005 | 11.182 | 11.535 |
| exporters | 18.946 | 12.343 | 0.007 | 11.342 | 11.721 |
| **Wood** | **16.439** | **11.864** | **0.003** | **10.590** | **11.327** |
| nonexporters | 15.967 | 11.804 | 0.002 | 10.555 | 11.232 |
| exporters | 18.008 | 12.065 | 0.006 | 10.708 | 11.640 |
| **Furniture** | **16.505** | **11.843** | **0.007** | **10.741** | **11.319** |
| nonexporters | 16.195 | 11.794 | 0.006 | 10.703 | 11.250 |
| exporters | 17.970 | 12.074 | 0.011 | 10.919 | 11.644 |
| **Pulp and paper** | **16.229** | **11.873** | **0.003** | **10.749** | **11.220** |
| nonexporters | 15.941 | 11.807 | 0.002 | 10.683 | 11.131 |
| exporters | 18.678 | 12.436 | 0.005 | 11.306 | 11.971 |
| **Rubber products** | **15.807** | **12.016** | **0.005** | **10.798** | **11.379** |
| nonexporters | 15.381 | 11.971 | 0.005 | 10.727 | 11.302 |
| exporters | 18.260 | 12.275 | 0.004 | 11.209 | 11.815 |

| | lnS | lnK | ADV | lnHK | lnPHK |
|---|---|---|---|---|---|
| Leather | **15.483** | **11.683** | **0.004** | **10.478** | **10.478** |
| nonexporters | 14.874 | 11.595 | 0.002 | 10.402 | 10.402 |
| exporters | 17.678 | 11.999 | 0.013 | 10.753 | 10.753 |
| Chemicals | **18.071** | **12.951** | **0.007** | **11.510** | **12.474** |
| nonexporters | 17.690 | 12.909 | 0.006 | 11.467 | 12.406 |
| exporters | 18.815 | 13.033 | 0.008 | 11.593 | 12.607 |
| Pharmaceutical, cosmetics | **16.034** | **12.182** | **0.021** | **10.851** | **11.601** |
| nonexporters | 15.678 | 12.119 | 0.019 | 10.758 | 11.519 |
| exporters | 18.741 | 12.660 | 0.033 | 11.552 | 12.223 |
| Plastics | **17.245** | **12.144** | **0.005** | **10.985** | **11.534** |
| nonexporters | 16.949 | 12.079 | 0.004 | 10.936 | 11.445 |
| exporters | 18.418 | 12.402 | 0.008 | 11.179 | 11.891 |
| Textiles | **17.829** | **12.129** | **0.003** | **10.897** | **11.609** |
| nonexporters | 17.179 | 12.077 | 0.002 | 10.843 | 11.490 |
| exporters | 18.661 | 12.196 | 0.004 | 10.965 | 11.761 |
| Clothing | **16.598** | **11.895** | **0.006** | **10.713** | **11.312** |
| nonexporters | 16.348 | 11.881 | 0.004 | 10.684 | 11.291 |
| exporters | 17.881 | 11.970 | 0.011 | 10.860 | 11.420 |
| Footwear | **17.020** | **11.594** | **0.007** | **10.637** | **10.994** |
| nonexporters | 16.255 | 11.646 | 0.004 | 10.626 | 11.013 |
| exporters | 17.785 | 11.542 | 0.010 | 10.649 | 10.974 |
| Food and tobacco | **17.103** | **12.175** | **0.009** | **10.827** | **11.554** |
| nonexporters | 16.622 | 12.082 | 0.008 | 10.751 | 11.416 |
| exporters | 19.103 | 12.560 | 0.014 | 11.145 | 12.128 |
| Printing | **16.488** | **12.185** | **0.004** | **11.146** | **11.617** |
| nonexporters | 16.336 | 12.162 | 0.004 | 11.120 | 11.589 |
| exporters | 19.013 | 12.580 | 0.010 | 11.582 | 12.069 |
| Other manufactures | **16.911** | **12.380** | **0.012** | **11.084** | **11.889** |
| nonexporters | 16.229 | 12.360 | 0.009 | 11.033 | 11.871 |
| exporters | 18.118 | 12.414 | 0.018 | 11.175 | 11.921 |

Source: 1978 data base.

Table C-2

Estimated Regression Coefficients of the Subsector Dummy Variables

| Subsector | Regression Model | | | |
|---|---|---|---|---|
| | 02 | 03 | 05 | 06 |
| Non-metallic minerals | -4.167 | -14.500 | -3.953 | -14.841 |
| | (0.306) | (1.472) | (0.304) | (1.538) |
| Basic iron and steel | -3.690 | -14.006 | -3.404 | -14.346 |
| | (0.315) | (1.465) | (0.314) | (1.538) |
| Basic non-ferrous | -4.227 | -14.462 | -4.019 | -14.840 |
| | (0.347) | (1.523) | (0.346) | (1.593) |
| Metal products | -3.843 | -14.062 | -3.577 | -14.406 |
| | (0.287) | (1.425) | (0.285) | (1.499) |
| Machinery | -2.825 | -13.122 | -2.487 | -13.450 |
| | (0.287) | (1.405) | (0.287) | (1.488) |
| Electrical equipment | -3.328 | -13.629 | -3.067 | -13.962 |
| | (0.296) | (1.424) | (0.294) | (1.498) |
| Transport equipment | -3.248 | -13.480 | -2.893 | -13.784 |
| | (0.302) | (1.428) | (0.302) | (1.507) |
| Wood | -3.690 | -13.607 | -3.626 | -13.983 |
| | (0.292) | (1.406) | (0.288) | (1.464) |
| Furniture | -4.207 | -14.215 | -4.013 | -14.562 |
| | (0.299) | (1.428) | (0.297) | (1.493) |
| Pulp and paper | -4.777 | -14.783 | -4.496 | -15.097 |
| | (0.299) | (1.462) | (0.297) | (1.535) |
| Rubber products | -3.935 | -13.883 | -3.722 | -14.224 |
| | (0.318) | (1.456) | (0.316) | (1.526) |
| Leather | -3.229 | -12.814 | -3.092 | -13.176 |
| | (0.285) | (1.363) | (0.282) | (1.427) |
| Chemicals | -3.624 | -14.400 | -3.597 | -14.797 |
| | (0.310) | (1.490) | (0.304) | (1.551) |
| Pharmaceutical, cosmetics | -4.668 | -15.117 | -4.529 | -15.477 |
| | (0.309) | (1.508) | (0.304) | (1.575) |
| Plastics | -4.294 | -14.549 | -4.091 | -14.888 |
| | (0.306) | (1.460) | (0.304) | (1.526) |
| Textiles | -3.412 | -13.586 | -3.280 | -13.959 |
| | (0.286) | (1.413) | (0.282) | (1.476) |
| Clothing | -4.347 | -14.406 | -4.153 | -14.743 |
| | (0.293) | (1.426) | (0.290) | (1.492) |
| Footwear | -2.928 | | -2.609 | |
| | (0.298) | | (0.297) | |
| Food and tobacco | -4.480 | -14.935 | -4.438 | -15.330 |
| | (0.286) | (1.471) | (0.281) | (1.531) |
| Printing | -5.433 | -15.535 | -5.101 | -15.867 |
| | (0.384) | (1.628) | (0.383) | (1.699) |
| Other manufactures | -3.070 | -13.307 | -2.936 | -13.688 |
| | (0.303) | (1.426) | (0.299) | (1.491) |

Note: The statistics in parentheses are the asymptotic standard errors of the coefficients. All coefficients are significantly different from zero at the .01 level of confidence.

## D. STATISTICAL APPENDIX TO CHAPTER V

Table D-1

Concentration Indices, Implicit Tariff Protection and Industry Dummies (variables H, T and D1-D139)

| Industry | Number of Exporters | Herfindahl Index | Implicit Tariff(%) | Industry Dummy |
|---|---|---|---|---|
| NON-METALLIC MINERALS | | | | |
| 1010 | 8 | .0653 | -15.5 | D1 |
| 1040 | 40 | .0254 | -27.5 | D2 |
| 1050 | 5 | .0555 | -34.1 | D3 |
| 1060 | 11 | .1082 | -34.1 | D4 |
| 1070 | 21 | .1209 | 19.5 | D5 |
| 1080 | 8 | .0648 | -27.5 | D6 |
| 1099 | 9 | .1672 | -27.5 | D7 |
| BASIC IRON AND STEEL | | | | |
| 1101 | 27 | .0991 | -32.9 | D8 |
| 1102 | 3 | .6660 | -8.9 | D9 |
| 1103 | 9 | .1143 | -8.9 | D10 |
| 1104 | 23 | .1479 | -9.9 | D11 |
| 1105 | 13 | .2157 | -22.2 | D12 |
| 1106 | 23 | .0695 | 31.3 | D13 |
| 1107 | 7 | .1842 | -16.4 | D14 |
| 1109 | 3 | .2359 | 15.7 | D15 |
| BASIC NON-FERROUS METALS | | | | |
| 1111 | 12 | .1283 | -16.5 | D16 |
| 1112 | 3 | .2478 | -16.5 | D17 |
| 1113 | 6 | .2621 | -16.5 | D18 |
| 1114 | 1 | .3155 | -16.5 | D19 |
| 1115 | 8 | .1175 | -16.5 | D19 |
| 1116 | 1 | .6378 | -16.5 | D19 |
| 1117 | 1 | .3075 | -16.5 | D19 |
| 1118 | 5 | .2248 | -16.5 | D20 |
| 1119 | 2 | .2111 | -16.5 | D20 |
| METAL PRODUCTS | | | | |
| 1120 | 8 | .1136 | -16.5 | D21 |
| 1130 | 14 | .0889 | 15.7 | D22 |
| 1140 | 27 | .0465 | 15.7 | D23 |
| 1150 | 17 | .0573 | 15.7 | D24 |
| 1160 | 22 | .0788 | 15.7 | D25 |
| 1170 | 42 | .0481 | 15.7 | D26 |
| 1180 | 1 | .0712 | 15.7 | D27 |
| 1199 | 129 | .0110 | 15.7 | D27 |

| Industry | Number of Exporters | Herfindahl Index | Implicit Tariff(%) | Industry Dummy |
|---|---|---|---|---|
| MACHINERY | | | | |
| 1210 | 8 | .2492 | 17.1 | D28 |
| 1220 | 77 | .0170 | 29.5 | D29 |
| 1231 | 74 | .0303 | 85.1 | D30 |
| 1232 | 23 | .0358 | 85.1 | D31 |
| 1240 | 66 | .0900 | -18.3 | D32 |
| 1251 | 93 | .0269 | 29.5 | D33 |
| 1253 | 4 | .4391 | -18.3 | D34 |
| 1254 | 9 | .1729 | -5.8 | D35 |
| 1260 | 2 | .2058 | -5.8 | D35 |
| 1270 | 16 | .1246 | -47.8 | D36 |
| 1280 | 2 | .3225 | 29.5 | D37 |
| 1299 | 101 | .0202 | 29.5 | D37 |
| ELECTRICAL EQUIPMENT | | | | |
| 1310 | 35 | .1382 | -11.3 | D38 |
| 1320 | 39 | .0281 | 52.9 | D39 |
| 1330 | 2 | .4266 | 52.9 | D39 |
| 1340 | 20 | .2450 | 52.9 | D40 |
| 1351 | 17 | .1689 | 34.7 | D41 |
| 1352 | 60 | .1230 | 34.7 | D42 |
| 1353 | 2 | .2940 | 34.7 | D42 |
| 1370 | 25 | .0906 | 96.4 | D43 |
| 1380 | 32 | .0870 | 63.2 | D44 |
| TRANSPORT EQUIPMENT | | | | |
| 1411 | 9 | .1761 | 19.6 | D45 |
| 1421 | 7 | .2393 | -6.4 | D46 |
| 1432 | 15 | .1971 | -6.4 | D47 |
| 1433 | 122 | .0212 | -23.2 | D48 |
| 1434 | 3 | .0890 | -15.5 | D49 |
| 1440 | 19 | .0536 | -15.5 | D50 |
| 1450 | 9 | .1527 | -15.5 | D51 |
| WOOD | | | | |
| 1510 | 65 | .0112 | 33.6 | D52 |
| 1520 | 7 | .0322 | -8.9 | D53 |
| 1530 | 33 | .1017 | 33.6 | D54 |
| 1550 | 17 | .0243 | -23.1 | D55 |
| FURNITURE | | | | |
| 1610 | 57 | .0079 | 20.0 | D56 |
| 1620 | 16 | .0401 | 20.0 | D57 |
| 1630 | 5 | .1299 | 20.0 | D58 |
| 1699 | 6 | .1024 | 20.0 | D59 |
| PULP AND PAPER | | | | |
| 1710 | 4 | .5113 | -37.7 | D60 |
| 1720 | 44 | .0260 | -9.0 | D61 |
| 1730 | 27 | .0374 | -32.4 | D62 |
| 1740 | 9 | .0188 | -32.4 | D63 |
| 1790 | 1 | .1965 | -32.4 | D63 |

| Industry | Number of Exporters | Herfindahl Index | Implicit Tariff(%) | Industry Dummy |
|---|---|---|---|---|
| RUBBER PRODUCTS | | | | |
| 1821 | 8 | .3044 | -20.9 | D64 |
| 1830 | 7 | .1055 | -28.2 | D65 |
| 1840 | 4 | .1231 | -28.2 | D66 |
| 1899 | 35 | .0249 | -28.2 | D67 |
| LEATHER | | | | |
| 1910 | 92 | .0224 | 10.0 | D68 |
| 1911 | 2 | .3825 | 10.0 | D68 |
| 1930 | 11 | .0678 | 10.0 | D69 |
| 1999 | 24 | .0397 | 10.0 | D70 |
| CHEMICALS | | | | |
| 2000 | 36 | .0705 | 55.1 | D71 |
| 2011 | 3 | .9469 | 0.0 | D72 |
| 2012 | 10 | .1092 | 24.9 | D73 |
| 2017 | 3 | .6404 | 11.9 | D74 |
| 2020 | 8 | .1317 | 63.6 | D75 |
| 2031 | 4 | .2528 | 84.4 | D76 |
| 2040 | 39 | .0473 | -46.5 | D77 |
| 2050 | 5 | .3409 | 84.4 | D78 |
| 2060 | 15 | .0724 | 84.4 | D79 |
| 2070 | 28 | .0532 | 42.1 | D80 |
| 2080 | 3 | .0655 | 17.8 | D81 |
| 2099 | 43 | .0555 | 84.4 | D82 |
| PHARMACEUTICAL, COSMETICS AND SOAPS | | | | |
| 2110 | 58 | .0359 | 79.0 | D83 |
| 2210 | 13 | .0885 | 28.5 | D84 |
| 2220 | 13 | .2390 | 28.5 | D85 |
| 2230 | 2 | .0626 | 28.5 | D85 |
| PLASTICS | | | | |
| 2310 | 6 | .2077 | 14.3 | D86 |
| 2320 | 20 | .0430 | 14.3 | D87 |
| 2330 | 10 | .1102 | 14.3 | D88 |
| 2340 | 4 | .1441 | 14.3 | D89 |
| 2350 | 14 | .0253 | 14.3 | D90 |
| 2360 | 9 | .1972 | 14.3 | D91 |
| 2399 | 21 | .0360 | 14.3 | D92 |
| TEXTILES | | | | |
| 2410 | 32 | .0158 | -5.0 | D93 |
| 2420 | 232 | .0237 | 12.9 | D94 |
| 2430 | 47 | .0401 | 26.0 | D95 |
| 2440 | 14 | .0895 | 26.0 | D96 |
| 2450 | 12 | .1770 | 30.0 | D97 |
| 2460 | 10 | .0804 | 35.0 | D98 |
| 2499 | 30 | .1062 | 26.0 | D99 |

| Industry | Number of Exporters | Herfindahl Index | Implicit Tariff(%) | Industry Dummy |
|---|---|---|---|---|
| CLOTHING | | | | |
| 2510 | 77 | .0102 | 23.1 | D100 |
| 2520 | 3 | .2457 | 23.1 | D100 |
| 2540 | 18 | .0416 | 23.1 | D102 |
| 2599 | 6 | .0535 | 23.1 | D103 |
| FOOTWEAR | | | | |
| 2530 | 136 | .0138 | 27.5 | D101 |
| FOOD | | | | |
| 2601 | 8 | .0069 | -38.6 | D104 |
| 2602 | 4 | .0418 | -28.3 | D105 |
| 2603 | 1 | .0185 | -41.7 | D106 |
| 2604 | 7 | .2238 | -41.7 | D106 |
| 2605 | 4 | .5129 | 21.4 | D107 |
| 2606 | 1 | .1045 | 21.4 | D107 |
| 2609 | 35 | .2872 | 21.4 | D108 |
| 2610 | 22 | .1667 | 24.3 | D109 |
| 2620 | 32 | .0152 | -25.4 | D110 |
| 2621 | 9 | .0678 | 55.1 | D111 |
| 2630 | 19 | .0655 | -2.4 | D112 |
| 2640 | 9 | .1413 | 64.2 | D113 |
| 2651 | 33 | .0115 | 3.1 | D114 |
| 2652 | 3 | .2794 | 3.1 | D114 |
| 2660 | 23 | .0614 | -45.8 | D115 |
| 2680 | 6 | .0404 | -45.8 | D116 |
| 2691 | 51 | .0644 | 3.1 | D117 |
| 2692 | 3 | .8191 | 92.7 | D118 |
| 2698 | 3 | .1032 | -33.5 | D119 |
| 2699 | 19 | .0453 | -21.8 | D120 |
| BEVERAGES | | | | |
| 2710 | 6 | .0404 | -9.9 | D121 |
| 2720 | 15 | .0398 | -9.9 | D122 |
| 2730 | 3 | .1577 | -9.9 | D123 |
| 2741 | 6 | .0498 | -9.9 | D124 |
| TOBACCO | | | | |
| 2810 | 1 | .1891 | -3.6 | D125 |
| 2820 | 5 | .5837 | -3.6 | D125 |
| 2830 | 2 | .6200 | -3.6 | D125 |
| 2899 | 2 | .1475 | -3.6 | D125 |
| PRINTING | | | | |
| 2910 | 8 | .0491 | 18.1 | D126 |
| 2920 | 8 | .0218 | 18.1 | D127 |
| 2999 | 1 | .0359 | 18.1 | D127 |

| Industry | Number of Exporters | Herfindahl Index | Implicit Tariff(%) | Industry Dummy |
|---|---|---|---|---|
| OTHER MANUFACTURES | | | | |
| 3000 | 10 | .1106 | 73.9 | D128 |
| 3011 | 1 | .8402 | 73.9 | D129 |
| 3012 | 17 | .0816 | 73.9 | D129 |
| 3021 | 2 | .8550 | 73.9 | D130 |
| 3023 | 9 | .0689 | 73.9 | D130 |
| 3031 | 9 | .3964 | 73.9 | D131 |
| 3032 | 5 | .1521 | 73.9 | D132 |
| 3033 | 4 | .1962 | 73.9 | D133 |
| 3041 | 4 | .2614 | 73.9 | D134 |
| 3042 | 4 | .2523 | 73.9 | D135 |
| 3050 | 5 | .2261 | 73.9 | D136 |
| 3070 | 6 | .3906 | 73.9 | D137 |
| 3080 | 6 | .1469 | 73.9 | D138 |
| 3099 | 56 | .0226 | 73.9 | D139 |

Source: 1978 data base and W.G. Tyler, "Politica comercial e industrial no Brasil: uma analise sob a otica de protecao efetiva para vendas no mercado domestico, 1980/81," IPEA/INPES, mimeo, July 1981.

## Table D-2

Estimated Regression Coefficients of the Industry Dummy Terms in Equations 02 and 05

| Variable | Equation 02 coefficient | Equation 02 standard error | Equation 05 coefficient | Equation 05 standard error |
|---|---|---|---|---|
| D1 | 7.219** | 1.023 | 9.055** | 1.040 |
| D2 | 6.354** | 0.835 | 8.134** | 0.859 |
| D3 | 6.629** | 1.174 | 8.531** | 1.180 |
| D4 | 6.424** | 0.959 | 8.231** | 0.971 |
| D5 | 6.344** | 0.894 | 8.145** | 0.920 |
| D6 | 6.989** | 1.032 | 8.888** | 1.054 |
| D7 | 5.834** | 1.016 | 7.676** | 1.038 |
| D8 | 8.486** | 0.849 | 10.329** | 0.859 |
| D9 | 7.425** | 1.507 | 9.198** | 1.536 |
| D10 | 8.872** | 1.027 | 10.733** | 1.037 |
| D11 | 7.146** | 0.923 | 8.982** | 0.944 |
| D12 | 6.922** | 0.980 | 8.776** | 1.002 |
| D13 | 6.312** | 0.873 | 8.099** | 0.905 |
| D14 | 5.975** | 1.102 | 7.842** | 1.120 |
| D15 | 6.237** | 1.371 | 8.108** | 1.391 |
| D16 | 7.673** | 0.979 | 9.541** | 0.989 |
| D17 | 6.876** | 1.357 | 8.741** | 1.370 |
| D18 | 4.253** | 1.127 | 6.094** | 1.152 |
| D19 | 4.563** | 0.986 | 6.380** | 1.015 |
| D20 | 6.722** | 1.078 | 8.560** | 1.095 |
| D21 | 6.452** | 1.032 | 8.272** | 1.054 |
| D22 | 6.823** | 0.948 | 8.656** | 0.966 |
| D23 | 6.255** | 0.869 | 8.069** | 0.892 |
| D24 | 5.813** | 0.898 | 7.579** | 0.922 |
| D25 | 7.243** | 0.886 | 9.063** | 0.910 |
| D26 | 7.289** | 0.832 | 9.071** | 0.858 |
| D27 | 5.808** | 0.802 | 7.619** | 0.827 |
| D28 | 6.575** | 1.069 | 8.415** | 1.094 |
| D29 | 6.655** | 0.822 | 8.494** | 0.849 |
| D30 | 7.265** | 0.827 | 9.115** | 0.859 |
| D31 | 6.354** | 0.881 | 8.145** | 0.908 |
| D32 | 6.335** | 0.821 | 8.156** | 0.845 |
| D33 | 6.752** | 0.811 | 8.577** | 0.845 |
| D34 | 7.628** | 1.319 | 9.549** | 1.346 |
| D35 | 7.446** | 0.981 | 9.237** | 0.995 |
| D36 | 7.244** | 0.938 | 9.118** | 0.959 |
| D37 | 6.627** | 0.815 | 8.466** | 0.845 |
| D38 | 7.171** | 0.862 | 9.018** | 0.890 |
| D39 | 6.081** | 0.845 | 7.876** | 0.869 |
| D40 | 6.196** | 0.911 | 7.957** | 0.942 |
| D41 | 6.407** | 0.922 | 8.168** | 0.943 |
| D42 | 6.331** | 0.830 | 8.141** | 0.859 |
| D43 | 6.894** | 0.878 | 8.741** | 0.900 |
| D44 | 6.594** | 0.862 | 8.376** | 0.886 |
| D45 | 9.476** | 1.048 | 11.352** | 1.056 |
| D46 | 7.824** | 1.110 | 9.643** | 1.133 |
| D47 | 9.175** | 0.958 | 11.207** | 0.991 |

| Variable | Equation 02 coefficient | Equation 02 standard error | Equation 05 coefficient | Equation 05 standard error |
|---|---|---|---|---|
| D48 | 5.937** | 0.803 | 7.750** | 0.830 |
| D49 | 6.399** | 1.351 | 8.302** | 1.369 |
| D50 | 6.385** | 0.896 | 8.207** | 0.923 |
| D51 | 6.021** | 1.012 | 7.829** | 1.029 |
| D52 | 8.149** | 0.799 | 9.951** | 0.803 |
| D53 | 5.797** | 1.039 | 7.552** | 1.052 |
| D54 | 7.628** | 0.839 | 9.380** | 0.855 |
| D55 | 6.840** | 0.882 | 8.619** | 0.897 |
| D56 | 5.875** | 0.806 | 7.637** | 0.824 |
| D57 | 5.355** | 0.917 | 7.158** | 0.936 |
| D58 | 5.593** | 1.150 | 7.397** | 1.158 |
| D59 | 6.655** | 1.087 | 8.398** | 1.100 |
| D60 | 8.215** | 1.328 | 10.072** | 1.352 |
| D61 | 6.053** | 0.836 | 7.865** | 0.856 |
| D62 | 5.127** | 0.862 | 6.972** | 0.884 |
| D63 | 5.642** | 1.002 | 7.556** | 1.011 |
| D64 | 6.365** | 1.080 | 8.221** | 1.100 |
| D65 | 5.711** | 1.057 | 7.526** | 1.079 |
| D66 | 4.187** | 1.220 | 6.014** | 1.232 |
| D67 | 5.722** | 0.839 | 7.541** | 0.865 |
| D68 | 7.186** | 0.783 | 8.987** | 0.794 |
| D69 | 6.649** | 0.948 | 8.337** | 0.966 |
| D70 | 6.884** | 0.837 | 8.623** | 0.860 |
| D71 | 6.693** | 0.868 | 8.617** | 0.885 |
| D72 | 6.395** | 1.694 | 8.426** | 1.719 |
| D73 | 5.814** | 1.043 | 7.764** | 1.058 |
| D74 | 5.682** | 1.486 | 7.611** | 1.493 |
| D75 | 6.079** | 1.069 | 7.940** | 1.085 |
| D76 | 8.530** | 1.249 | 10.328** | 1.263 |
| D77 | 8.627** | 0.834 | 10.540** | 0.826 |
| D78 | 7.685** | 1.212 | 9.575** | 1.235 |
| D79 | 5.384** | 0.944 | 7.220** | 0.957 |
| D80 | 5.135** | 0.879 | 6.973** | 0.894 |
| D81 | 7.420** | 1.370 | 9.366** | 1.378 |
| D82 | 6.119** | 0.853 | 7.948** | 0.874 |
| D83 | 6.169** | 0.844 | 7.973** | 0.869 |
| D84 | 5.510** | 0.950 | 7.311** | 0.968 |
| D85 | 6.219** | 0.934 | 8.001** | 0.945 |
| D86 | 6.288** | 1.130 | 8.129** | 1.153 |
| D87 | 5.600** | 0.886 | 7.472** | 0.909 |
| D88 | 5.336** | 0.994 | 7.129** | 1.002 |
| D89 | 5.519** | 1.220 | 7.288** | 1.238 |
| D90 | 5.102** | 0.934 | 6.922** | 0.949 |
| D91 | 4.624** | 1.029 | 6.457** | 1.049 |
| D92 | 5.695** | 0.883 | 7.483** | 0.898 |
| D93 | 7.428** | 0.846 | 9.256** | 0.853 |
| D94 | 7.407** | 0.789 | 9.196** | 0.805 |
| D95 | 6.755** | 0.818 | 8.509** | 0.837 |
| D96 | 5.668** | 0.920 | 7.417** | 0.939 |
| D97 | 6.834** | 0.973 | 8.638** | 0.990 |
| D98 | 7.823** | 0.978 | 9.587** | 0.993 |
| D99 | 6.929** | 0.864 | 8.624** | 0.885 |

| Variable | Equation 02 | | Equation 05 | |
|---|---|---|---|---|
| | coefficient | standard error | coefficient | standard error |
| D100 | 6.185** | 0.796 | 7.957** | 0.816 |
| D101 | 8.169** | 0.749 | 9.879** | 0.777 |
| D102 | 6.811** | 0.873 | 8.571** | 0.891 |
| D103 | 6.899** | 1.084 | 8.672** | 1.095 |
| D104 | 8.487** | 1.052 | 10.445** | 1.058 |
| D105 | 5.494** | 1.219 | 7.303** | 1.231 |
| D106 | 10.996** | 1.060 | 12.967** | 1.070 |
| D107 | 7.798** | 1.222 | 9.618** | 1.227 |
| D108 | 8.876** | 0.864 | 10.654** | 0.871 |
| D109 | 6.972** | 0.873 | 8.720** | 0.885 |
| D110 | 8.168** | 0.857 | 10.001** | 0.871 |
| D111 | 9.173** | 1.004 | 10.910** | 1.014 |
| D112 | 8.470** | 0.875 | 10.219** | 0.891 |
| D113 | 7.604** | 1.019 | 9.343** | 1.032 |
| D114 | 9.948** | 0.895 | 11.914** | 0.908 |
| D115 | 6.720** | 0.867 | 8.503** | 0.885 |
| D116 | 4.498** | 1.090 | 6.278** | 1.106 |
| D117 | 9.540** | 0.852 | 11.416** | 0.845 |
| D118 | 5.500** | 1.551 | 7.209** | 1.573 |
| D119 | 3.845** | 1.346 | 5.722** | 1.365 |
| D120 | 8.506** | 0.883 | 10.335** | 0.890 |
| D121 | 5.235** | 1.089 | 7.063** | 1.081 |
| D122 | 5.291** | 0.929 | 7.146** | 0.935 |
| D123 | 5.990** | 1.365 | 7.811** | 1.381 |
| D124 | 6.400** | 1.090 | 8.222** | 1.105 |
| D125 | 8.046** | 1.082 | 10.087** | 1.110 |
| D126 | 5.630** | 1.051 | 7.470** | 1.077 |
| D127 | 5.157** | 1.010 | 6.978** | 1.029 |
| D128 | 6.415** | 0.979 | 8.160** | 1.005 |
| D129 | 6.842** | 0.910 | 8.705** | 0.937 |
| D130 | 6.562** | 0.980 | 8.325** | 0.999 |
| D131 | 8.362** | 1.083 | 10.285** | 1.078 |
| D132 | 6.795** | 1.181 | 8.623** | 1.194 |
| D133 | 6.280** | 1.234 | 8.057** | 1.261 |
| D134 | 7.522** | 1.253 | 9.286** | 1.272 |
| D135 | 6.713** | 1.295 | 8.639** | 1.308 |
| D136 | 6.961** | 1.160 | 8.688** | 1.177 |
| D137 | 6.397** | 1.159 | 8.129** | 1.177 |
| D138 | 7.181** | 1.088 | 8.905** | 1.106 |
| D139 | 7.116** | 0.814 | 8.885** | 0.833 |

Note: All coefficients are statistically significant at the .01 level.

Table D-3

Estimated Regression Coefficients of the Industry Dummy Terms in Equations 03 and 06

| Variable | Equation 03 | | Equation 06 | |
|---|---|---|---|---|
| | coefficient | standard error | coefficient | standard error |
| D1 | 37.079** | 10.072 | 39.318** | 10.072 |
| D2 | 10.415* | 5.036 | 11.690* | 5.050 |
| D3 | 32.244 | 58.746 | 30.304 | 58.798 |
| D4 | 22.040** | 3.996 | 23.709** | 3.996 |
| D5 | 3.533 | 4.930 | 5.379 | 4.936 |
| D6 | 15.366 | 8.169 | 17.374* | 8.185 |
| D7 | 3.827 | 6.071 | 5.431 | 6.077 |
| D8 | -0.436 | 6.945 | 0.367 | 6.955 |
| D9 | -3.423 | 8.676 | -1.886 | 8.692 |
| D10 | -0.865 | 7.173 | 0.649 | 7.177 |
| D11 | -10.361 | 5.514 | -8.620 | 5.534 |
| D12 | -10.734 | 8.464 | -8.964 | 8.474 |
| D13 | -6.365 | 5.456 | -4.683 | 5.467 |
| D14 | -17.317 | 14.022 | -15.010 | 14.033 |
| D15 | 17.453 | 17.914 | 19.253 | 17.929 |
| D16 | 13.578 | 7.305 | 15.183* | 7.323 |
| D17 | 28.793** | 7.113 | 30.785** | 7.127 |
| D18 | 24.531* | 11.653 | 25.834* | 11.674 |
| D19 | 1.115 | 9.461 | 3.119 | 9.477 |
| D20 | 4.592 | 14.039 | 5.877 | 14.050 |
| D21 | 17.547 | 13.509 | 18.666 | 13.519 |
| D22 | -4.657 | 5.043 | -3.640 | 5.054 |
| D23 | 3.372 | 5.516 | 5.133 | 5.523 |
| D24 | 5.916 | 6.299 | 7.061 | 6.308 |
| D25 | 15.700** | 4.651 | 17.571** | 4.651 |
| D26 | 0.928 | 4.296 | 2.884 | 4.320 |
| D27 | 3.327 | 2.701 | 4.901 | 2.724 |
| D28 | 4.540 | 11.381 | 6.046 | 11.404 |
| D29 | 9.962* | 3.971 | 12.019** | 3.975 |
| D30 | 2.226 | 3.896 | 4.802 | 3.923 |
| D31 | -1.528 | 7.638 | -0.431 | 7.648 |
| D32 | -4.313 | 3.186 | -2.836 | 3.199 |
| D33 | 1.263 | 2.711 | 2.898 | 2.735 |
| D34 | 3.508 | 10.852 | 4.171 | 10.864 |
| D35 | -2.297 | 6.227 | -0.394 | 6.223 |
| D36 | -5.211 | 6.054 | -3.223 | 6.067 |
| D37 | 3.208 | 2.904 | 4.976 | 2.918 |
| D38 | -1.518 | 4.556 | 0.144 | 4.564 |
| D39 | 2.429 | 5.816 | 4.181 | 5.839 |
| D40 | 3.934 | 4.996 | 5.441 | 5.001 |
| D41 | -5.249 | 5.566 | -3.964 | 5.582 |
| D42 | 1.077 | 3.197 | 3.112 | 3.215 |
| D43 | 10.807** | 4.170 | 14.533** | 4.295 |
| D44 | -6.409 | 4.270 | -4.759 | 4.289 |
| D45 | 9.715 | 6.387 | 11.378 | 6.394 |
| D46 | -12.616 | 9.261 | -10.790 | 9.273 |
| D47 | -5.428 | 3.811 | -2.679 | 3.850 |

| Variable | Equation 03 | | Equation 06 | |
|---|---|---|---|---|
| | coefficient | standard error | coefficient | standard error |
| D48 | -2.591 | 2.368 | -0.875 | 2.367 |
| D49 | -39.677 | 76.748 | -38.696 | 76.847 |
| D50 | 10.662 | 6.549 | 12.412 | 6.554 |
| D51 | -12.476 | 7.775 | -10.763 | 7.786 |
| D52 | 6.059* | 3.053 | 8.618** | 3.068 |
| D53 | -21.941 | 25.162 | -20.806 | 25.186 |
| D54 | 15.406** | 4.197 | 16.577** | 4.196 |
| D55 | 9.642 | 9.515 | 11.557 | 9.519 |
| D56 | 12.069** | 3.273 | 13.542** | 3.281 |
| D57 | 10.987 | 10.962 | 12.383 | 10.964 |
| D58 | 2.884 | 14.630 | 4.851 | 14.635 |
| D59 | -18.281 | 14.589 | -16.502 | 14.603 |
| D60 | 28.144 | 15.121 | 29.465 | 15.144 |
| D61 | 9.692** | 3.634 | 11.079** | 3.641 |
| D62 | 2.442 | 3.248 | 4.326 | 3.244 |
| D63 | 5.478 | 12.121 | 9.234 | 12.098 |
| D64 | -3.878 | 7.054 | -2.385 | 7.067 |
| D65 | 13.914 | 12.985 | 15.487 | 13.004 |
| D66 | 18.779 | 16.978 | 19.872 | 16.998 |
| D67 | 7.008 | 4.743 | 8.635 | 4.745 |
| D68 | 7.765* | 3.040 | 10.146** | 3.052 |
| D69 | -5.940 | 5.261 | -5.008 | 5.265 |
| D70 | 1.786 | 4.215 | 3.251 | 4.225 |
| D71 | 17.690** | 2.925 | 19.705** | 2.922 |
| D72 | -10.551 | 8.134 | -8.456 | 8.177 |
| D73 | 35.255** | 12.075 | 35.960** | 12.087 |
| D74 | 12.809 | 8.823 | 13.605 | 8.845 |
| D75 | 6.023 | 5.952 | 7.904 | 5.980 |
| D76 | 11.008 | 19.254 | 12.002 | 19.270 |
| D77 | 10.135** | 2.594 | 11.842** | 2.619 |
| D78 | 23.461* | 10.674 | 25.036* | 10.677 |
| D79 | 2.331 | 5.479 | 3.931 | 5.477 |
| D80 | 0.679 | 5.974 | 2.406 | 5.979 |
| D81 | 8.064 | 4.431 | 9.897* | 4.448 |
| D82 | 13.145** | 4.027 | 14.660** | 4.040 |
| D83 | -3.230 | 3.179 | -1.837 | 3.186 |
| D84 | 8.605 | 4.706 | 10.262* | 4.725 |
| D85 | 6.474 | 3.850 | 7.811* | 3.848 |
| D86 | 8.266 | 11.744 | 9.861 | 11.758 |
| D87 | -1.572 | 5.968 | 2.549 | 6.028 |
| D88 | -1.260 | 7.071 | 0.520 | 7.068 |
| D89 | -4.758 | 19.964 | -3.462 | 19.985 |
| D90 | 5.959 | 9.670 | 7.623 | 9.669 |
| D91 | -12.255 | 8.299 | -10.268 | 8.310 |
| D92 | 0.637 | 5.942 | 2.631 | 5.951 |
| D93 | 19.326** | 4.042 | 20.881** | 4.032 |
| D94 | 6.587** | 1.955 | 8.460** | 1.950 |
| D95 | 9.123* | 4.077 | 10.852** | 4.086 |
| D96 | -12.675 | 11.268 | -10.764 | 11.285 |
| D97 | -5.339 | 8.368 | -2.998 | 8.364 |
| D98 | 4.181 | 9.834 | 5.816 | 9.846 |
| D99 | -2.687 | 5.028 | -1.088 | 5.036 |

| | Equation 03 | | Equation 06 | |
|---|---|---|---|---|
| Variable | coefficient | standard error | coefficient | standard error |
| D100 | 3.370 | 2.873 | 5.486 | 2.880 |
| D101 | 15.461** | 1.566 | 17.134** | 1.599 |
| D102 | 21.695** | 5.051 | 23.558** | 5.051 |
| D103 | -9.477 | 16.199 | -7.154 | 16.215 |
| D104 | 9.516 | 10.292 | 11.743 | 10.303 |
| D105 | -2.582 | 11.912 | -1.405 | 11.925 |
| D106 | 6.000 | 15.344 | 6.975 | 15.381 |
| D107 | 9.124 | 8.517 | 10.136 | 8.526 |
| D108 | 13.184** | 2.325 | 14.771** | 2.327 |
| D109 | 13.083** | 4.211 | 14.619** | 4.214 |
| D110 | 17.832** | 4.605 | 19.608** | 4.609 |
| D111 | 5.511 | 6.867 | 7.014 | 6.877 |
| D112 | 11.785* | 5.593 | 13.678* | 5.593 |
| D113 | 18.862** | 4.544 | 20.419** | 4.559 |
| D114 | 22.203** | 4.942 | 24.713** | 4.953 |
| D115 | 1.304 | 6.412 | 2.857 | 6.414 |
| D116 | 0.124 | 14.525 | 1.193 | 14.538 |
| D117 | 7.412 | 4.224 | 8.913* | 4.218 |
| D118 | 29.406* | 12.542 | 30.889* | 12.553 |
| D119 | 47.343 | 51.036 | 52.861 | 51.088 |
| D120 | 13.907* | 5.522 | 15.270** | 5.531 |
| D121 | 9.402 | 10.420 | 10.858 | 10.430 |
| D122 | 18.305** | 4.425 | 19.993** | 4.434 |
| D123 | -7.587 | 69.520 | -6.339 | 69.585 |
| D124 | 5.953 | 7.750 | 7.062 | 7.762 |
| D125 | 8.130* | 3.867 | 9.355* | 3.853 |
| D126 | -14.884 | 10.542 | -13.587 | 10.550 |
| D127 | 5.519 | 9.803 | 7.063 | 9.808 |
| D128 | -5.701 | 9.518 | -3.766 | 9.529 |
| D129 | -11.997 | 7.960 | -10.309 | 7.966 |
| D130 | -8.036 | 8.350 | -6.946 | 8.373 |
| D131 | 11.023 | 6.667 | 13.801* | 6.659 |
| D132 | -32.176* | 13.476 | -30.522* | 13.495 |
| D133 | 34.627 | 19.311 | 37.668 | 19.344 |
| D134 | -3.587 | 30.805 | -1.132 | 30.835 |
| D135 | -21.708 | 24.836 | -19.922 | 24.868 |
| D136 | 2.675 | 12.464 | 4.069 | 12.472 |
| D137 | -9.519 | 9.911 | -7.899 | 9.920 |
| D138 | 13.004 | 43.748 | 15.960 | 43.793 |
| D139 | 12.380** | 2.291 | 14.283** | 2.299 |

Note: (*) indicates significance at the .05 level of confidence and (**) at the .01 level.

Table D-4

Estimated Regression Coefficients of the Industry-Domestic Sales Interaction Terms in Equations 03 and 06

| Variable | Equation 03 | | Equation 06 | |
|---|---|---|---|---|
| | coefficient | standard error | coefficient | standard error |
| NON-METALLIC MINERALS | | | | |
| lnDS*D1 | -2.548** | 0.586 | -2.565** | 0.587 |
| lnDS*D2 | -1.019** | 0.269 | -0.986** | 0.269 |
| lnDS*D3 | -2.111 | 3.014 | -1.908 | 3.016 |
| lnDS*D4 | -1.657** | 0.216 | -1.643** | 0.216 |
| lnDS*D5 | -0.649* | 0.260 | -0.644* | 0.261 |
| lnDS*D6 | -1.270** | 0.457 | -1.270** | 0.457 |
| lnDS*D7 | -0.686* | 0.337 | -0.665* | 0.338 |
| BASIC IRON AND STEEL | | | | |
| lnDS*D8 | -0.293 | 0.388 | -0.228 | 0.389 |
| lnDS*D9 | -0.223 | 0.436 | -0.202 | 0.436 |
| lnDS*D10 | -0.282 | 0.378 | -0.257 | 0.378 |
| lnDS*D11 | 0.061 | 0.268 | 0.072 | 0.268 |
| lnDS*D12 | 0.132 | 0.442 | 0.143 | 0.443 |
| lnDS*D13 | -0.105 | 0.296 | -0.093 | 0.297 |
| lnDS*D14 | 0.365 | 0.697 | 0.350 | 0.698 |
| lnDS*D15 | -1.374 | 0.926 | -1.364 | 0.927 |
| BASIC NON-FERROUS METALS | | | | |
| lnDS*D16 | -1.094** | 0.371 | -1.074** | 0.371 |
| lnDS*D17 | -2.028** | 0.394 | -2.029** | 0.394 |
| lnDS*D18 | -1.839** | 0.601 | -1.804** | 0.601 |
| lnDS*D19 | -0.607 | 0.518 | -0.610 | 0.518 |
| lnDS*D20 | -0.675 | 0.752 | -0.638 | 0.753 |
| METAL PRODUCTS | | | | |
| lnDS*D21 | -1.411 | 0.744 | -1.365 | 0.745 |
| lnDS*D22 | -0.183 | 0.270 | -0.132 | 0.270 |
| lnDS*D23 | -0.644* | 0.291 | -0.635* | 0.292 |
| lnDS*D24 | -0.807* | 0.344 | -0.766* | 0.344 |
| lnDS*D25 | -1.267** | 0.253 | -1.263** | 0.254 |
| lnDS*D26 | -0.454* | 0.231 | -0.457* | 0.231 |
| lnDS*D27 | -0.664** | 0.145 | -0.644** | 0.145 |
| MACHINERY | | | | |
| lnDS*D28 | -0.687 | 0.605 | -0.662 | 0.606 |
| lnDS*D29 | -0.978** | 0.214 | -0.983** | 0.214 |
| lnDS*D30 | -0.517* | 0.215 | -0.551* | 0.216 |
| lnDS*D31 | -0.360 | 0.424 | -0.315 | 0.425 |
| lnDS*D32 | -0.211 | 0.173 | -0.186 | 0.173 |
| lnDS*D33 | -0.492** | 0.147 | -0.475** | 0.147 |
| lnDS*D34 | -0.580 | 0.546 | -0.508 | 0.547 |
| lnDS*D35 | -0.298 | 0.315 | -0.297 | 0.316 |
| lnDS*D36 | -0.159 | 0.305 | -0.158 | 0.306 |
| lnDS*D37 | -0.609** | 0.158 | -0.598** | 0.158 |

| Variable | Equation 03 | | Equation 06 | |
|---|---|---|---|---|
| | coefficient | standard error | coefficient | standard error |
| ELECTRICAL EQUIPMENT | | | | |
| lnDS*D38 | -0.330 | 0.242 | -0.313 | 0.242 |
| lnDS*D39 | -0.604* | 0.305 | -0.595 | 0.305 |
| lnDS*D40 | -0.673* | 0.268 | -0.652* | 0.268 |
| lnDS*D41 | -0.207 | 0.281 | -0.176 | 0.282 |
| lnDS*D42 | -0.507** | 0.172 | -0.512** | 0.172 |
| lnDS*D43 | -1.004** | 0.218 | -1.097** | 0.222 |
| lnDS*D44 | -0.103 | 0.226 | -0.089 | 0.226 |
| TRANSPORT EQUIPMENT | | | | |
| lnDS*D45 | -0.809* | 0.328 | -0.791* | 0.328 |
| lnDS*D46 | 0.258 | 0.474 | 0.265 | 0.475 |
| lnDS*D47 | -0.087 | 0.181 | -0.115 | 0.181 |
| lnDS*D48 | -0.339** | 0.123 | -0.327** | 0.124 |
| lnDS*D49 | 1.747 | 4.248 | 1.805 | 4.253 |
| lnDS*D50 | -1.023** | 0.344 | -1.013** | 0.344 |
| lnDS*D51 | 0.217 | 0.425 | 0.229 | 0.426 |
| WOOD | | | | |
| lnDS*D52 | -0.675** | 0.174 | -0.713** | 0.175 |
| lnDS*D53 | 0.751 | 1.405 | 0.793 | 1.406 |
| lnDS*D54 | -1.222** | 0.228 | -1.183** | 0.229 |
| lnDS*D55 | -0.956 | 0.539 | -0.957 | 0.539 |
| FURNITURE | | | | |
| lnDS*D56 | -1.150** | 0.182 | -1.127** | 0.182 |
| lnDS*D57 | -1.109 | 0.599 | -1.080 | 0.601 |
| lnDS*D58 | -0.646 | 0.796 | -0.648 | 0.796 |
| lnDS*D59 | 0.574 | 0.803 | 0.579 | 0.804 |
| PULP AND PAPER | | | | |
| lnDS*D60 | -1.807* | 0.768 | -1.772* | 0.769 |
| lnDS*D61 | -0.990** | 0.190 | -0.961** | 0.191 |
| lnDS*D62 | -0.650** | 0.174 | -0.646** | 0.174 |
| lnDS*D63 | -0.790 | 0.688 | -0.889 | 0.688 |
| RUBBER PRODUCTS | | | | |
| lnDS*D64 | -0.285 | 0.346 | -0.260 | 0.347 |
| lnDS*D65 | -1.265 | 0.733 | -1.245 | 0.734 |
| lnDS*D66 | -1.674 | 1.016 | -1.624 | 1.017 |
| lnDS*D67 | -0.871** | 0.262 | -0.854** | 0.262 |
| lnDS*D68 | -0.829** | 0.172 | -0.856** | 0.172 |
| lnDS*D69 | -0.073 | 0.302 | -0.022 | 0.303 |
| lnDS*D70 | -0.496* | 0.249 | -0.474 | 0.249 |

| Variable | Equation 03 | | Equation 06 | |
|---|---|---|---|---|
| | coefficient | standard error | coefficient | standard error |
| CHEMICALS | | | | |
| lnDS*D71 | -1.404** | 0.157 | -1.402** | 0.157 |
| lnDS*D72 | 0.011 | 0.373 | 0.017 | 0.374 |
| lnDS*D73 | -2.236** | 0.592 | -2.169** | 0.593 |
| lnDS*D74 | -1.163* | 0.475 | -1.094* | 0.474 |
| lnDS*D75 | -0.793** | 0.294 | -0.787** | 0.295 |
| lnDS*D76 | -0.921 | 1.015 | -0.871 | 1.017 |
| lnDS*D77 | -0.884** | 0.148 | -0.866** | 0.148 |
| lnDS*D78 | -1.666** | 0.593 | -1.641** | 0.594 |
| lnDS*D79 | -0.635* | 0.294 | -0.616* | 0.295 |
| lnDS*D80 | -0.562 | 0.310 | -0.550 | 0.310 |
| lnDS*D81 | -0.845** | 0.230 | -0.832** | 0.230 |
| lnDS*D82 | -1.174** | 0.215 | -1.150** | 0.216 |
| PHARMACEUTICAL, COSMETICS AND SOAPS | | | | |
| lnDS*D83 | -0.305 | 0.166 | -0.277 | 0.166 |
| lnDS*D84 | -0.975** | 0.254 | -0.961** | 0.254 |
| lnDS*D85 | -0.810** | 0.210 | -0.779** | 0.210 |
| PLASTICS | | | | |
| lnDS*D86 | -0.893 | 0.588 | -0.873 | 0.588 |
| lnDS*D87 | -0.405 | 0.326 | -0.522 | 0.329 |
| lnDS*D88 | -0.437 | 0.386 | -0.430 | 0.387 |
| lnDS*D89 | -0.234 | 1.096 | -0.201 | 1.097 |
| lnDS*D90 | -0.843 | 0.518 | -0.828 | 0.519 |
| lnDS*D91 | 0.104 | 0.439 | 0.103 | 0.440 |
| lnDS*D92 | -0.520 | 0.327 | -0.525 | 0.327 |
| TEXTILES | | | | |
| lnDS*D93 | -1.465** | 0.224 | -1.444** | 0.225 |
| lnDS*D94 | -0.753** | 0.100 | -0.751** | 0.100 |
| lnDS*D95 | -0.931** | 0.223 | -0.923** | 0.223 |
| lnDS*D96 | 0.215 | 0.620 | 0.213 | 0.620 |
| lnDS*D97 | -0.131 | 0.453 | -0.153 | 0.453 |
| lnDS*D98 | -0.599 | 0.531 | -0.586 | 0.531 |
| lnDS*D99 | -0.288 | 0.264 | -0.276 | 0.264 |
| CLOTHING | | | | |
| lnDS*D100 | -0.644** | 0.157 | -0.657** | 0.157 |
| lnDS*D102 | -1.689** | 0.298 | -1.689** | 0.298 |
| lnDS*D103 | 0.141 | 0.929 | 0.116 | 0.930 |
| FOOTWEAR | | | | |
| lnDS*D101 | -1.238** | 0.087 | -1.229** | 0.087 |

| Variable | Equation 03 | | Equation 06 | |
|---|---|---|---|---|
| | coefficient | standard error | coefficient | standard error |
| FOOD | | | | |
| lnDS*D104 | -0.856 | 0.569 | -0.865 | 0.570 |
| lnDS*D105 | -0.381 | 0.612 | -0.342 | 0.613 |
| lnDS*D106 | -0.513 | 0.880 | -0.449 | 0.880 |
| lnDS*D107 | -0.859 | 0.457 | -0.808 | 0.457 |
| lnDS*D108 | -1.046** | 0.131 | -1.028** | 0.131 |
| lnDS*D109 | -1.138** | 0.232 | -1.119** | 0.232 |
| lnDS*D110 | -1.292** | 0.232 | -1.283** | 0.232 |
| lnDS*D111 | -0.613 | 0.340 | -0.595 | 0.340 |
| lnDS*D112 | -0.986** | 0.311 | -0.988** | 0.312 |
| lnDS*D113 | -1.382** | 0.231 | -1.366** | 0.232 |
| lnDS*D114 | -1.452** | 0.258 | -1.475** | 0.258 |
| lnDS*D115 | -0.509 | 0.344 | -0.490 | 0.345 |
| lnDS*D116 | -0.574 | 0.766 | -0.530 | 0.767 |
| lnDS*D117 | -0.684** | 0.220 | -0.659** | 0.220 |
| lnDS*D118 | -2.018** | 0.640 | -1.998** | 0.641 |
| lnDS*D119 | -2.957 | 2.540 | -3.131 | 2.542 |
| lnDS*D120 | -1.102** | 0.313 | -1.069** | 0.313 |
| BEVERAGES | | | | |
| lnDS*D121 | -1.032 | 0.584 | -1.005 | 0.584 |
| lnDS*D122 | -1.552** | 0.251 | -1.536** | 0.251 |
| lnDS*D123 | -0.170 | 3.206 | -0.136 | 3.209 |
| lnDS*D124 | -0.776 | 0.439 | -0.729 | 0.439 |
| TOBACCO | | | | |
| lnDS*D125 | -0.806** | 0.205 | -0.756** | 0.207 |
| PRINTING | | | | |
| lnDS*D126 | 0.254 | 0.538 | 0.289 | 0.539 |
| lnDS*D127 | -0.819 | 0.527 | -0.798 | 0.528 |
| OTHER MANUFACTURES | | | | |
| lnDS*D128 | -0.128 | 0.524 | -0.131 | 0.525 |
| lnDS*D129 | 0.257 | 0.445 | 0.273 | 0.445 |
| lnDS*D130 | 0.009 | 0.463 | 0.054 | 0.463 |
| lnDS*D131 | -0.963* | 0.427 | -1.013* | 0.427 |
| lnDS*D132 | 1.298 | 0.724 | 1.314 | 0.725 |
| lnDS*D133 | -2.432* | 1.111 | -2.498* | 1.112 |
| lnDS*D134 | -0.194 | 1.678 | -0.225 | 1.679 |
| lnDS*D135 | 0.613 | 1.231 | 0.626 | 1.232 |
| lnDS*D136 | -0.559 | 0.691 | -0.534 | 0.691 |
| lnDS*D137 | 0.050 | 0.526 | 0.063 | 0.526 |
| lnDS*D138 | -1.126 | 2.457 | -1.188 | 2.459 |
| lnDS*D139 | -1.098** | 0.124 | -1.099** | 0.124 |

Note: (*) indicates significance at the .05 level of confidence and (**) at the .01 level.

Table D-5

Estimated Regression Coefficients of the Industry Dummy Terms in Equations 08 and 11

| Variable | Equation 08 | | Equation 11 | |
|---|---|---|---|---|
| | coefficient | standard error | coefficient | standard error |
| D1 | 6.779** | 1.021 | 10.326** | 1.871 |
| D2 | 5.879** | 0.836 | 8.184** | 1.728 |
| D3 | 6.212** | 1.169 | | |
| D4 | 6.006** | 0.958 | 10.628** | 1.795 |
| D5 | 5.881** | 0.895 | 8.860** | 1.789 |
| D6 | 6.553** | 1.029 | 11.166** | 1.952 |
| D7 | 5.865** | 1.037 | 8.164** | 1.952 |
| D8 | 7.842** | 0.851 | 11.537** | 2.083 |
| D9 | 6.639** | 0.501 | | |
| D10 | 8.263** | 1.026 | | |
| D11 | 6.472** | 0.930 | | |
| D12 | 6.364** | 0.980 | | |
| D13 | 5.810** | 0.873 | 8.182** | 1.771 |
| D14 | 5.375** | 1.099 | | |
| D15 | 5.669** | 1.364 | | |
| D16 | 7.325** | 0.977 | | |
| D17 | 6.352** | 1.350 | 10.239** | 2.111 |
| D18 | 3.790** | 1.123 | | |
| D19 | 4.049** | 0.999 | | |
| D20 | 6.476** | 1.111 | | |
| D21 | 5.935** | 1.030 | | |
| D22 | 6.344** | 0.948 | 9.722** | 1.840 |
| D23 | 5.693** | 0.870 | 9.151** | 1.784 |
| D24 | 5.276** | 0.898 | 7.886** | 1.835 |
| D25 | 6.552** | 0.888 | 10.151** | 1.832 |
| D26 | 6.748** | 0.833 | 9.331** | 1.707 |
| D27 | 5.381** | 0.805 | 8.578** | 1.636 |
| D28 | 6.063** | 1.067 | 10.194** | 2.227 |
| D29 | 6.200** | 0.825 | 9.136** | 1.750 |
| D30 | 6.796** | 0.830 | 9.800** | 1.747 |
| D31 | 5.765** | 0.883 | 9.013** | 2.006 |
| D32 | 5.704** | 0.826 | 8.016** | 1.702 |
| D33 | 6.230** | 0.814 | 10.599** | 1.682 |
| D34 | 6.908** | 1.315 | | |
| D35 | 6.783** | 0.981 | 8.829** | 2.169 |
| D36 | 6.568** | 0.939 | 7.507** | 2.152 |
| D37 | 6.152** | 0.818 | 9.184** | 1.649 |
| D38 | 6.674** | 0.864 | 9.667** | 1.807 |
| D39 | 5.577** | 0.847 | 7.625** | 1.818 |
| D40 | 5.718** | 0.912 | 8.920** | 2.072 |
| D41 | 5.889** | 0.922 | 8.801** | 2.018 |
| D42 | 5.849** | 0.833 | 9.245** | 1.755 |
| D43 | 6.259** | 0.880 | 9.499** | 1.916 |
| D44 | 6.022** | 0.863 | 10.138** | 1.802 |
| D45 | 8.988** | 1.047 | 11.421** | 2.159 |
| D46 | 7.202** | 1.108 | | |
| D47 | 8.406** | 0.959 | | |

| Variable | Equation 08 coefficient | Equation 08 standard error | Equation 11 coefficient | Equation 11 standard error |
|---|---|---|---|---|
| D48 | 5.438** | 0.806 | 7.764** | 1.657 |
| D49 | 5.886** | 1.344 | 9.055** | 2.009 |
| D50 | 5.858** | 0.896 | 11.235** | 2.042 |
| D51 | 5.384** | 1.011 | 7.668** | 2.149 |
| D52 | 7.744** | 0.801 | 10.346** | 1.646 |
| D53 | 5.280** | 1.036 | | |
| D54 | 6.940** | 0.842 | 10.761** | 1.816 |
| D55 | 6.363** | 0.881 | 8.650** | 2.014 |
| D56 | 5.422** | 0.808 | 8.969** | 1.600 |
| D57 | 4.854** | 0.922 | 8.776** | 1.928 |
| D58 | 4.900** | 1.147 | | |
| D59 | 6.168** | 1.083 | 8.806** | 1.941 |
| D60 | 7.948** | 1.322 | | |
| D61 | 5.452** | 0.838 | 8.671** | 1.698 |
| D62 | 4.553** | 0.864 | 7.554** | 1.714 |
| D63 | 4.947** | 1.005 | 8.286** | 2.097 |
| D64 | 5.667** | 1.080 | 9.890** | 2.178 |
| D65 | 5.103** | 1.055 | 9.816** | 1.952 |
| D66 | 3.581** | 1.215 | 7.508** | 2.106 |
| D67 | 5.210** | 0.841 | 8.559** | 1.673 |
| D68 | 6.951** | 0.784 | 9.063** | 1.617 |
| D69 | 6.097** | 0.946 | | |
| D70 | 6.300** | 0.839 | 8.157** | 1.673 |
| D71 | 6.296** | 0.869 | 8.806** | 2.191 |
| D72 | 5.704** | 1.688 | 12.736** | 3.541 |
| D73 | 5.388** | 1.042 | | |
| D74 | 5.472** | 1.659 | | |
| D75 | 5.434** | 1.068 | 9.222** | 2.137 |
| D76 | 8.004** | 1.244 | | |
| D77 | 8.219** | 0.836 | 11.634** | 1.703 |
| D78 | 7.158** | 1.209 | | |
| D79 | 4.970** | 0.944 | 8.737** | 1.764 |
| D80 | 4.688** | 0.880 | 8.140** | 1.779 |
| D81 | 6.995** | 1.363 | 10.317** | 2.165 |
| D82 | 5.584** | 0.857 | 8.018** | 1.789 |
| D83 | 5.848** | 0.845 | 9.374** | 1.699 |
| D84 | 5.074** | 0.949 | 8.188** | 1.871 |
| D85 | 5.927** | 0.951 | 11.014** | 1.901 |
| D86 | 5.654** | 1.127 | | |
| D87 | 5.133** | 0.893 | 9.087** | 1.757 |
| D88 | 4.718** | 0.993 | 8.266** | 1 953 |
| D89 | 5.311** | 1.213 | | |
| D90 | 4.560** | 0.934 | 8.134** | 1.942 |
| D91 | 4.095** | 1.028 | 8.790** | 2.164 |
| D92 | 5.106** | 0.885 | 9.096** | 1.799 |
| D93 | 6.809** | 0.848 | 10.459** | 1.751 |
| D94 | 6.602** | 0.795 | 9.027** | 1.652 |
| D95 | 5.978** | 0.822 | 9.701** | 1.656 |
| D96 | 4.762** | 0.936 | 8.816** | 2.115 |
| D97 | 5.848** | 0.978 | | |
| D98 | 7.001** | 0.979 | | |
| D99 | 6.140** | 0.870 | 8.373** | 1.930 |

| | Equation 08 | | Equation 11 | |
|---|---|---|---|---|
| Variable | coefficient | standard error | coefficient | standard error |
| D100 | 5.498** | 0.802 | 8.458** | 1.630 |
| D101 | 7.840** | 0.750 | 7.355** | 1.614 |
| D102 | 6.152** | 0.880 | 8.255** | 1.831 |
| D103 | 6.258** | 1.081 | 9.424** | 1.909 |
| D104 | 7.928** | 1.051 | 11.375** | 1.845 |
| D105 | 4.945** | 1.213 | 7.895** | 2.043 |
| D106 | 10.705** | 1.058 | 14.655** | 2.014 |
| D107 | 7.694** | 1.217 | | |
| D108 | 8.370** | 0.870 | 12.474** | 2.070 |
| D109 | 6.418** | 0.874 | 8.746** | 1.864 |
| D110 | 7.672** | 0.857 | 11.070** | 1.697 |
| D111 | 8.618** | 1.002 | 14.046** | 2.003 |
| D112 | 8.078** | 0.875 | 11.442** | 1.782 |
| D113 | 7.266** | 1.017 | 12.651** | 1.952 |
| D114 | 9.536** | 0.896 | 12.708** | 1.829 |
| D115 | 6.555** | 0.870 | 9.057** | 1.724 |
| D116 | 4.100** | 1.086 | 7.113** | 1.953 |
| D117 | 9.272** | 0.853 | 13.254** | 1.705 |
| D118 | 5.276** | 1.542 | | |
| D119 | 3.331** | 1.338 | 7.903** | 2.163 |
| D120 | 8.282** | 0.888 | 11.233** | 2.074 |
| D121 | 4.846** | 1.085 | 8.605** | 1.950 |
| D122 | 4.783** | 0.929 | 8.409** | 1.745 |
| D123 | 5.447** | 1.357 | | |
| D124 | 5.960** | 1.086 | 7.231** | 2.031 |
| D125 | 7.517** | 1.081 | 11.990** | 2.307 |
| D126 | 4.917** | 1.050 | | |
| D127 | 4.599** | 1.008 | 7.551** | 1.830 |
| D128 | 5.918** | 0.978 | 8.962** | 2.010 |
| D129 | 6.212** | 0.912 | 8.052** | 1.991 |
| D130 | 5.908** | 0.980 | 10.432** | 2.071 |
| D131 | 8.039** | 1.081 | | |
| D132 | 6.329** | 1.176 | | |
| D133 | 5.741** | 1.228 | | |
| D134 | 6.804** | 1.249 | | |
| D135 | 6.225** | 1.290 | 9.309** | 2.379 |
| D136 | 6.392** | 1.156 | | |
| D137 | 5.751** | 1.156 | | |
| D138 | 6.651** | 1.085 | 10.313** | 2.167 |
| D139 | 6.691** | 0.816 | 9.078** | 1.704 |

Note: All coefficients are statistically significant at the .01 level of confidence.

Table D-6

Estimated Regression Coefficients of the Industry Dummy Terms in Equations 09 and 12

| Variable | Equation 09 coefficient | Equation 09 standard error | Equation 12 coefficient | Equation 12 standard error |
|---|---|---|---|---|
| D1 | 36.317** | 9.961 | 34.037** | 11.512 |
| D2 | 9.820* | 4.980 | 16.721 | 15.850 |
| D3 | 35.157 | 58.090 | | |
| D4 | 22.081** | 3.953 | 24.764** | 6.233 |
| D5 | 2.568 | 4.878 | 7.439 | 10.953 |
| D6 | 14.338 | 8.079 | 22.046* | 11.107 |
| D7 | 2.121 | 6.014 | 20.380 | 10.807 |
| D8 | -0.884 | 6.868 | | |
| D9 | -1.423 | 8.583 | | |
| D10 | 0.688 | 7.100 | | |
| D11 | -10.560 | 5.737 | | |
| D12 | -11.430 | 8.371 | | |
| D13 | -5.848 | 5.397 | 2.641 | 10.878 |
| D14 | -17.795 | 13.866 | | |
| D15 | 16.361 | 17.714 | | |
| D16 | 13.758 | 7.224 | | |
| D17 | 28.445** | 7.035 | 29.804** | 7.121 |
| D18 | 24.047* | 11.523 | | |
| D19 | -0.203 | 10.590 | | |
| D20 | 4.794 | 14.018 | | |
| D21 | 16.869 | 13.358 | | |
| D22 | -4.591 | 4.987 | -4.147 | 6.076 |
| D23 | 3.928 | 5.456 | 68.237** | 20.243 |
| D24 | 4.887 | 6.230 | 12.512 | 11.335 |
| D25 | 14.409** | 4.604 | 15.530 | 14.697 |
| D26 | 0.682 | 4.251 | 8.810 | 8.458 |
| D27 | 2.635 | 2.691 | -3.581 | 5.229 |
| D28 | 5.083 | 11.254 | | |
| D29 | 9.539* | 3.933 | 14.641 | 8.256 |
| D30 | 1.190 | 3.865 | 23.815* | 10.021 |
| D31 | -1.508 | 7.553 | -29.933 | 22.891 |
| D32 | -4.299 | 3.212 | 1.661 | 7.935 |
| D33 | 0.458 | 2.697 | 3.485 | 5.240 |
| D34 | 2.406 | 10.731 | | |
| D35 | -2.344 | 6.159 | | |
| D36 | -4.892 | 5.989 | | |
| D37 | 2.442 | 2.876 | 10.138 | 7.487 |
| D38 | -2.400 | 4.508 | 17.903 | 33.357 |
| D39 | 1.684 | 5.753 | 88.224* | 38.142 |
| D40 | 3.750 | 4.941 | 34.835 | 20.962 |
| D41 | -5.619 | 5.505 | 2.539 | 26.804 |
| D42 | 2.190 | 3.286 | 13.621* | 5.506 |
| D43 | 10.087* | 4.126 | 33.731** | 12.626 |
| D44 | -7.002 | 4.225 | -0.045 | 9.758 |
| D45 | 9.573 | 6.316 | | |
| D46 | -12.047 | 9.158 | | |
| D47 | -5.443 | 3.770 | | |

| | Equation 09 | | Equation 12 | |
|---|---|---|---|---|
| Variable | coefficient | standard error | coefficient | standard error |
| D48 | -2.891 | 2.349 | 6.819 | 7.466 |
| D49 | -37.938 | 75.887 | -35.168 | 74.960 |
| D50 | 11.407 | 6.478 | | |
| D51 | -13.006 | 7.689 | | |
| D52 | 6.075* | 3.022 | 6.660 | 7.574 |
| D53 | -28.267 | 24.893 | | |
| D54 | 15.067** | 4.152 | 34.001** | 10.013 |
| D55 | 9.172 | 9.410 | | |
| D56 | 10.599** | 3.282 | 8.236 | 4.345 |
| D57 | 10.807 | 11.170 | 1.783 | 49.014 |
| D58 | 2.426 | 14.467 | | |
| D59 | -17.715 | 14.426 | -20.018 | 50.687 |
| D60 | 30.961* | 14.955 | | |
| D61 | 9.454** | 3.595 | 32.609** | 6.553 |
| D62 | 2.431 | 3.215 | 6.982 | 4.130 |
| D63 | -7.616 | 13.561 | | |
| D64 | -4.074 | 6.977 | 16.075 | 121.027 |
| D65 | 14.454 | 12.840 | 12.348 | 22.225 |
| D66 | 19.470 | 16.788 | | |
| D67 | 6.570 | 4.691 | 5.300 | 7.442 |
| D68 | 6.389* | 3.013 | 17.786** | 6.057 |
| D69 | -5.766 | 5.208 | | |
| D70 | 1.297 | 4.170 | 10.547 | 12.679 |
| D71 | 16.867** | 2.899 | | |
| D72 | -10.515 | 8.044 | -11.028 | 9.225 |
| D73 | 36.512** | 11.940 | | |
| D74 | 15.307 | 9.970 | | |
| D75 | 5.886 | 5.887 | | |
| D76 | 9.207 | 19.040 | | |
| D77 | 9.418** | 2.569 | 15.837** | 4.653 |
| D78 | 22.136* | 10.556 | | |
| D79 | 0.999 | 5.422 | -7.584 | 6.895 |
| D80 | -0.571 | 5.911 | 4.355 | 12.543 |
| D81 | 7.838 | 4.384 | | |
| D82 | 11.138** | 4.291 | 17.858 | 11.382 |
| D83 | -3.369 | 3.145 | 0.861 | 5.935 |
| D84 | 7.115 | 4.659 | 10.585 | 7.292 |
| D85 | 7.056 | 3.988 | 4.315 | 5.222 |
| D86 | 7.506 | 11.613 | | |
| D87 | -1.285 | 5.925 | 2.268 | 7.424 |
| D88 | -1.620 | 6.994 | -1.274 | 14.417 |
| D89 | -2.859 | 19.742 | | |
| D90 | 4.459 | 9.564 | -53.602 | 48.408 |
| D91 | -12.723 | 8.208 | | |
| D92 | 0.829 | 5.877 | -5.886 | 19.280 |
| D93 | 18.844** | 3.999 | 12.572 | 8.617 |
| D94 | 5.938** | 1.941 | 15.390* | 6.525 |
| D95 | 9.643* | 4.033 | 10.926 | 6.833 |
| D96 | -21.887 | 12.225 | | |
| D97 | -6.342 | 8.277 | | |
| D98 | 3.008 | 9.726 | | |
| D99 | 0.141 | 5.467 | -0.658 | 44.632 |

| Variable | Equation 09 coefficient | Equation 09 standard error | Equation 12 coefficient | Equation 12 standard error |
|---|---|---|---|---|
| D100 | 2.959 | 2.979 | -0.212 | 5.872 |
| D101 | 15.275** | 1.553 | 3.040 | 7.262 |
| D102 | 22.200** | 5.275 | -9.761 | 35.868 |
| D103 | -6.806 | 16.023 | -12.161 | 24.089 |
| D104 | 9.096 | 10.178 | 8.354 | 10.623 |
| D105 | -1.182 | 11.780 | | |
| D106 | 7.215 | 15.173 | 18.695 | 20.058 |
| D107 | 7.966 | 8.423 | | |
| D108 | 12.226** | 2.315 | -10.287 | 17.474 |
| D109 | 12.156** | 4.167 | 41.478** | 12.832 |
| D110 | 17.678** | 4.556 | 20.424** | 6.077 |
| D111 | 5.379 | 6.791 | 20.567** | 7.946 |
| D112 | 11.804* | 5.532 | -5.994 | 18.080 |
| D113 | 18.535** | 4.495 | 20.899** | 5.402 |
| D114 | 22.319** | 4.890 | 22.822** | 6.353 |
| D115 | -1.969 | 6.418 | -7.127 | 10.886 |
| D116 | 0.452 | 14.362 | 5.232 | 17.792 |
| D117 | 5.454 | 4.186 | -8.182 | 9.118 |
| D118 | 27.114* | 12.406 | | |
| D119 | 47.166 | 50.466 | | |
| D120 | 10.748* | 5.483 | | |
| D121 | 10.870 | 10.305 | 9.276 | 12.726 |
| D122 | 17.677** | 4.378 | 9.021 | 6.166 |
| D123 | -16.296 | 68.749 | | |
| D124 | 3.941 | 7.668 | | |
| D125 | 7.136 | 3.827 | 11.926* | 4.734 |
| D126 | -14.292 | 10.426 | | |
| D127 | 6.125 | 9.694 | 32.128 | 16.748 |
| D128 | -5.051 | 9.413 | -24.531 | 21.036 |
| D129 | -13.178 | 7.873 | 34.729 | 72.978 |
| D130 | -7.759 | 8.259 | | |
| D131 | 9.711 | 6.598 | | |
| D132 | -33.718* | 13.327 | | |
| D133 | 39.077* | 19.104 | | |
| D134 | -4.188 | 30.459 | | |
| D135 | -23.749 | 24.560 | | |
| D136 | 0.574 | 12.328 | | |
| D137 | -9.609 | 9.802 | | |
| D138 | 11.675 | 43.257 | | |
| D139 | 12.555** | 2.286 | -9.711 | 13.131 |

Note: (*) indicates significance at the .05 level of confidence and (**) at the .01 level.

Table D-7

Estimated Regression Coefficients of the Industry-Domestic Sales Interaction Terms in Equations 09 and 12

| Variable | Equation 09 | | Equation 12 | |
|---|---|---|---|---|
| | coefficient | standard error | coefficient | standard error |
| NON-METALLIC MINERALS | | | | |
| lnDS*D1 | -2.515** | 0.579 | -2.302** | 0.668 |
| lnDS*D2 | -0.999** | 0.266 | -1.385 | 0.882 |
| lnDS*D3 | -2.269 | 2.981 | | |
| lnDS*D4 | -1.669** | 0.213 | -1.777** | 0.373 |
| lnDS*D5 | -0.609* | 0.257 | -0.829 | 0.594 |
| lnDS*D6 | -1.223** | 0.452 | -1.546* | 0.666 |
| lnDS*D7 | -0.574 | 0.335 | -1.631* | 0.636 |
| BASIC IRON AND STEEL | | | | |
| lnDS*D8 | -0.290 | 0.384 | | |
| lnDS*D9 | -0.353 | 0.431 | | |
| lnDS*D10 | -0.382 | 0.374 | | |
| lnDS*D11 | 0.048 | 0.277 | | |
| lnDS*D12 | 0.153 | 0.437 | | |
| lnDS*D13 | -0.147 | 0.293 | -0.581 | 0.622 |
| lnDS*D14 | 0.372 | 0.689 | | |
| lnDS*D15 | -1.334 | 0.915 | | |
| BASIC NON-FERROUS METALS | | | | |
| lnDS*D16 | -1.108** | 0.366 | | |
| lnDS*D17 | -2.024** | 0.389 | -1.989** | 0.384 |
| lnDS*D18 | -1.825** | 0.594 | | |
| lnDS*D19 | -0.552 | 0.575 | | |
| lnDS*D20 | -0.686 | 0.749 | | |
| METAL PRODUCTS | | | | |
| lnDS*D21 | -1.388 | 0.736 | | |
| lnDS*D22 | -0.198 | 0.267 | -0.119 | 0.342 |
| lnDS*D23 | -0.690* | 0.288 | -4.223** | 1.138 |
| lnDS*D24 | -0.766* | 0.340 | -1.159 | 0.621 |
| lnDS*D25 | -1.219** | 0.251 | -1.197 | 0.818 |
| lnDS*D26 | -0.456* | 0.228 | -0.877 | 0.475 |
| lnDS*D27 | -0.635** | 0.145 | -0.216 | 0.285 |
| MACHINERY | | | | |
| lnDS*D28 | -0.730 | 0.598 | | |
| lnDS*D29 | -0.966** | 0.211 | -1.193** | 0.439 |
| lnDS*D30 | -0.470* | 0.214 | -1.688** | 0.551 |
| lnDS*D31 | -0.378 | 0.420 | 1.287 | 1.281 |
| lnDS*D32 | -0.233 | 0.175 | -0.532 | 0.451 |
| lnDS*D33 | -0.462** | 0.146 | -0.490 | 0.288 |
| lnDS*D34 | -0.547 | 0.540 | | |
| lnDS*D35 | -0.315 | 0.312 | | |
| lnDS*D36 | -0.196 | 0.302 | | |
| lnDS*D37 | -0.578** | 0.156 | -0.950* | 0.428 |

| Variable | Equation 09 | | Equation 12 | |
|---|---|---|---|---|
| | coefficient | standard error | coefficient | standard error |
| ELECTRICAL EQUIPMENT. | | | | |
| lnDS*D38 | -0.295 | 0.239 | -1 364 | 1.870 |
| lnDS*D39 | -0.577 | 0.302 | -5.134* | 2.009 |
| lnDS*D40 | -0.676* | 0.265 | -2.404* | 1.205 |
| lnDS*D41 | -0.201 | 0.278 | -0.584 | 1.371 |
| lnDS*D42 | -0.582** | 0.177 | -1.150** | 0.302 |
| lnDS*D43 | -0.985** | 0.216 | -2.131** | 0.635 |
| lnDS*D44 | -0.088 | 0.223 | -0.338 | 0.529 |
| TRANSPORT EQUIPMENT | | | | |
| lnDS*D45 | -0.814* | 0.324 | | |
| lnDS*D46 | 0.210 | 0.469 | | |
| lnDS*D47 | -0.109 | 0.179 | | |
| lnDS*D48 | -0.335** | 0.122 | -0.851* | 0.409 |
| lnDS*D49 | 1.637 | 4.201 | 1.553 | 4.151 |
| lnDS*D50 | -1.077** | 0.340 | | |
| lnDS*D51 | 0.225 | 0.420 | | |
| WOOD | | | | |
| lnDS*D52 | -0.686** | 0.172 | -0.678 | 0.441 |
| lnDS*D53 | 1.090 | 1.389 | | |
| lnDS*D54 | -1.227** | 0.226 | -2.208** | 0.555 |
| lnDS*D55 | -0.942 | 0.533 | | |
| FURNITURE | | | | |
| lnDS*D56 | -1.079** | 0.183 | -0.857** | 0.244 |
| lnDS*D57 | -1.114 | 0.612 | -0.502 | 2.787 |
| lnDS*D58 | -0.644 | 0.787 | | |
| lnDS*D59 | 0.530 | 0.794 | 0.762 | 2.921 |
| PULP AND PAPER | | | | |
| lnDS*D60 | -1.953* | 0.760 | | |
| lnDS*D61 | -0.994** | 0.188 | -2.264** | 0.365 |
| lnDS*D62 | -0.667** | 0.172 | -0.864** | 0.224 |
| lnDS*D63 | -0.074 | 0.767 | | |
| RUBBER PRODUCTS | | | | |
| lnDS*D64 | -0.296 | 0.343 | -1.231 | 6.473 |
| lnDS*D65 | -1.316 | 0.725 | -1.052 | 1.278 |
| lnDS*D66 | -1.738 | 1.005 | | |
| lnDS*D67 | -0.861** | 0.259 | -0.714 | 0.420 |
| lnDS*D68 | -0.751** | 0.170 | -1.408** | 0.356 |
| lnDS*D69 | -0.100 | 0.299 | | |
| lnDS*D70 | -0.487* | 0.246 | -1.046 | 0.773 |



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| Variable | Equation 09 | | Equation 12 | |
|---|---|---|---|---|
| | coefficient | standard error | coefficient | standard error |
| CHEMICALS | | | | |
| lnDS*D71 | -1.366** | 0.155 | | |
| lnDS*D72 | -0.012 | 0.369 | 0.235 | 0.421 |
| lnDS*D73 | -2.305** | 0.586 | | |
| lnDS*D74 | -1.279* | 0.518 | | |
| lnDS*D75 | -0.804** | 0.291 | | |
| lnDS*D76 | -0.840 | 1.004 | | |
| lnDS*D77 | -0.852** | 0.146 | -1.134** | 0.259 |
| lnDS*D78 | -1.608** | 0.586 | | |
| lnDS*D79 | -0.571* | 0.291 | 0.022 | 0.378 |
| lnDS*D80 | -0.506 | 0.306 | -0.691 | 0.666 |
| lnDS*D81 | -0.841** | 0.227 | | |
| lnDS*D82 | -1.079** | 0.229 | -1.437* | 0.627 |
| PHARMACEUTICAL, COSMETICS AND SOAPS | | | | |
| lnDS*D83 | -0.301 | 0.164 | -0.437 | 0.319 |
| lnDS*D84 | -0.903** | 0.251 | -1.030** | 0.393 |
| lnDS*D85 | -0.844** | 0.215 | -0.519 | 0.278 |
| PLASTICS | | | | |
| lnDS*D86 | -0.873 | 0.581 | | |
| lnDS*D87 | -0.432 | 0.324 | -0.529 | 0.406 |
| lnDS*D88 | -0.437 | 0.382 | -0.367 | 0.818 |
| lnDS*D89 | -0.338 | 1.084 | | |
| lnDS*D90 | -0.777 | 0.513 | 2.567 | 2.708 |
| lnDS*D91 | 0.115 | 0.434 | | |
| lnDS*D92 | -0.548 | 0.323 | -0.058 | 1.082 |
| TEXTILES | | | | |
| lnDS*D93 | -1.458** | 0.222 | -1.003* | 0.475 |
| lnDS*D94 | -0.746** | 0.010 | -1.247** | 0.348 |
| lnDS*D95 | -0.988** | 0.220 | -0.968* | 0.385 |
| lnDS*D96 | 0.680 | 0.669 | | |
| lnDS*D97 | -0.114 | 0.448 | | |
| lnDS*D98 | -0.565 | 0.525 | | |
| lnDS*D99 | -0.466 | 0.286 | -0.369 | 2.611 |
| CLOTHING | | | | |
| lnDS*D100 | -0.645** | 0.163 | -0.420 | 0.321 |
| lnDS*D102 | -1.751** | 0.314 | 0.152 | 2.087 |
| lnDS*D103 | -0.035** | 0.919 | 0.357 | 1.398 |
| FOOTWEAR | | | | |
| lnDS*D101 | -1.233** | 0.086 | -0.656 | 0.415 |



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| Variable | Equation 09 | | Equation 12 | |
|---|---|---|---|---|
| | coefficient | standard error | coefficient | standard error |
| FOOD | | | | |
| lnDS*D104 | -0.849 | 0.563 | -0.715 | 0.586 |
| lnDS*D105 | -0.467 | 0.606 | | |
| lnDS*D106 | -0.585 | 0.870 | -1.117 | 1.144 |
| lnDS*D107 | -0.791 | 0.452 | | |
| lnDS*D108 | -1.005** | 0.130 | 0.368 | 0.968 |
| lnDS*D109 | -1.103** | 0.230 | -2.771** | 0.731 |
| lnDS*D110 | -1.296** | 0.230 | -1.369** | 0.300 |
| lnDS*D111 | -0.620 | 0.336 | -1.230** | 0.397 |
| lnDS*D112 | -0.996** | 0.308 | 0.056 | 0.993 |
| lnDS*D113 | -1.369** | 0.229 | -1.356** | 0.286 |
| lnDS*D114 | -1.466** | 0.255 | -1.420** | 0.314 |
| lnDS*D115 | -0.327 | 0.345 | -0.005 | 0.598 |
| lnDS*D116 | -0.598 | 0.758 | -0.800 | 0.924 |
| lnDS*D117 | -0.582** | 0.218 | 0.263 | 0.490 |
| lnDS*D118 | -1.901** | 0.633 | | |
| lnDS*D119 | -2.960 | 2.511 | | |
| lnDS*D120 | -0.921** | 0.311 | | |
| BEVERAGES | | | | |
| lnDS*D121 | -1.122 | 0.577 | -0.927 | 0.690 |
| lnDS*D122 | -1.530** | 0.248 | -0.929** | 0.356 |
| lnDS*D123 | -0.220 | 3.171 | | |
| lnDS*D124 | -0.673 | 0.434 | | |
| TOBACCO | | | | |
| lnDS*D125 | -0.768** | 0.203 | -0.897** | 0.245 |
| PRINTING | | | | |
| lnDS*D126 | 0.202 | 0.532 | | |
| lnDS*D127 | -0.868 | 0.521 | -2.285* | 0.944 |
| OTHER MANUFACTURES | | | | |
| lnDS*D128 | -0.177 | 0.519 | 1.049 | 1.219 |
| lnDS*D129 | 0.302 | 0.440 | -2.473 | 4.283 |
| lnDS*D130 | -0.028 | 0.458 | | |
| lnDS*D131 | -0.886* | 0.422 | | |
| lnDS*D132 | 1.369 | 0.716 | | |
| lnDS*D133 | -2.707* | 1.099 | | |
| lnDS*D134 | -0.186 | 1.659 | | |
| lnDS*D135 | 0.703 | 1.217 | | |
| lnDS*D136 | -0.461 | 0.683 | | |
| lnDS*D137 | 0.034 | 0.520 | | |
| lnDS*D138 | -1.067 | 2.429 | | |
| lnDS*D139 | -1.117** | 0.123 | 0.180 | 0.745 |

Note: (*) indicates significance at the .05 level of confidence and (**) at the .01 level.

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